# Next Stop: Sustainable Transport

A Survey of Public Transport in Six Cities of Central and Eastern Europe

THE REGIONAL ENVIRONMENTAL CENTER
*for Central and Eastern Europe*

MILJØVERNDEPARTEMENTET
*Norwegian Ministry of the Environment*

# Next Stop: Sustainable Transport

## A Survey of Public Transport in Six Cities of Central and Eastern Europe

Editor
**Grazyna Krzywkowska**

Szentendre, Hungary
**September, 2004**

**Funded by The Royal Ministry of Environment, Norway**

THE REGIONAL ENVIRONMENTAL CENTER
*for Central and Eastern Europe*

MILJØVERNDEPARTEMENTET
*Norwegian Ministry of the Environment*

**About the REC**

The Regional Environmental Center for Central and Eastern Europe (REC) is a non-partisan, non-advocacy, not-for-profit international organisation with a mission to assist in solving environmental problems in Central and Eastern Europe (CEE). The REC fulfils this mission by promoting cooperation among non-governmental organisations, governments, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision making.

The REC was established in 1990 by the United States, the European Commission and Hungary. Today, the REC is legally based on a charter signed by the governments of 28 countries and the European Commission, and on an international agreement with the government of Hungary. The REC has its head office in Szentendre, Hungary, and country offices and field offices in 16 beneficiary countries which are: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYR Macedonia, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia and Turkey.

Recent donors are the European Commission and the governments of Austria, Belgium, Bosnia and Herzegovina, Canada, the Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Japan, Latvia, the Netherlands, Norway, Poland, Serbia and Montenegro, Slovenia, Sweden, Switzerland, the United Kingdom and the United States, as well as other inter-governmental and private institutions.



ISBN: 963 9424 48 X

Published by:
The Regional Environmental Center for Central and Eastern Europe
Ady Endre ut 9-11, 2000 Szentendre, Hungary
Tel: (36-26) 504-000, Fax: (36-26) 311-294
Website: <www.rec.org>

This and all REC publications are printed on recycled paper or paper produced
without the use of chlorine or chlorine-based chemicals

# Foreword

The urban areas in Central and Eastern Europe (CEE) are exposed to growing amounts of pollution that have major impacts on the environment and human health. Taking into account the rapidly increasing number of cars, congestion, urban sprawl and other related problems, public transport systems are of vital importance.

Central and Eastern European countries are known for their positive tradition of widely used public transport systems. This trend can be preserved for the future only through the continued implementation of necessary measures for restructuring, modernisation, improved reliability, accessibility and quality. It is crucial to support these countries if these efforts are to succeed. Policy guidance in the Europan Commision's white paper on "European Transport Policy for 2010: Time to Decide" sets clear priorities for doing so.

The success of public transport support is closely linked to the integration of environmental concerns into transport policies. Sustainable development is impossible without true sectoral integration. The same is true for the integration of environmental concerns into social and economic development. Therefore, the integration of environmental concerns into the transport sector is not simply a cost to be borne, but a requirement for sustainable development. Moreover, it creates conditions in which economies can thrive.

This publication summarises the results of a public transport support project in selected capitals of the EU's new member states and candidate countries. Both the publication and the project were funded by the Royal Ministry of Environment of Norway. Project beneficiaries (governmental institutions, municipalities, public transport companies and independent experts) established a discussion platform of policy makers and practitioners to find the best ways to address current public transport-related needs and problems in CEE. The project had a strong capacity-building side, thanks to site visits, exchanges of practical information, case studies discussed at meetings, information exchanges via electronic tools, and presentations of best practices.

It pleases greatly that the findings of this project can be used by environmental stakeholders to further improve public transport organisation, demand management, contractual issues, private-public partnerships and investments. The project has remained strongly focused on the needs of beneficiaries by providing, for example, practical and first-hand information on environmentally friendly public transport and ways to make more efficient use of available funding sources in the expanded EU.

I am confident that project beneficiaries recognise the great value of exchanging knowledge and experience. Therefore, the beneficiaries will be pleased that the material compiled in this publication will be able to assist others in their work.

**Marta Szigeti-Bonifert**
Executive Director
The Regional Environmental Center
for Central and Eastern Europe
Szentendre, Hungary
June 2004

# Acknowledgments

*Next Stop: Sustainable Transport* is a summary of the findings of the REC project Promotion of Public Transport in Central and Eastern Europe. Grazyna Krzywkowska, project manager (sectoral integration) of the Environmental Policy Programme at the REC, edited the publication. It was prepared in cooperation with Oreola Ivanova, the REC's deputy executive director. The editor would like to thank her for her comments and insight.

Thanks are also extended to Ausra Jurkeviciute, a REC project manager (environmental assessment), for her valuable contribution to this publication.

Financial support for the project came from the Royal Ministry of Environment of Norway, whom the editor would like to thank – especially Eldrid Nordbo and Marianne Gjorv.

The editor would like to thank the authors of the case studies constituting the main body of this publication: Dago Antov, Inseneriburoo Stratuum, Talinn, Estonia • Cristina Elena Balta and Victoria Carstea, Public Transport Company, Bucharest, Romania • Marija Burinskiene and Vytautas Grigonis, Vilnius Gediminas Technical University, Vilnius, Lithuania • Kristiana Chakarova, Institute for Transport and Communication, Sofia, Bulgaria • Fiorentina Gheorghita, Public Transport Company, Bucharest, Romania • James Lenoci, Lenoci and Partner Ltd, Budapest, Hungary • Andrzej Sambor and Wojciech Suchorzewski, Suchorzewski Konsulting, Warsaw, Poland.

The Overview of the Case Studies was written by Andrzej Kraszewski, Warsaw Technical University, Poland. He also contributed to the executive summary.

National beneficiaries of the project mentioned above, alongside national and international experts, have provided a wealth of comments and additions to the case-study recommendations and led lively discussions concerning possible ways of achieving the goal of sustainable public transport in new member states of the European Union and candidate countries. They also discussed tools for financing and promoting public transport in their countries, along with obstacles to sustainable public transport and sectoral integration of environmental, health and transport concerns into policy making. These comments, additions and discussions have assisted the editor in making this publication complete.

Finally, the editor would like to thank the following individuals, who cooperated on the project until August 2004: Metodi Avramov, Kristiana Chakarova, Mariana Krasteva, Ekaterina Tasheva (Bulgaria) • Jiri Bendl, Tomas Cocek, Marek Karban, Jiri Lavic, Libor Sima, Zdenek Suta, Lukas Soukup (Czech Republic) • Eero Aarniste, Koit Kaevats, Tiit Siimon, Terje Villemi (Estonia) • Laszlo Nagy, Aron Palvolgyi, Veronika Kisvari, Peter Merza (Hungary) • Gunta Birzniece (Latvia) • Vaidotas Antanavicius, Viktorija Puzaite, Vesta Vinskute (Lithuania) • Andrzej Brzezinski, Marek Chojecki, Filip Nowaczynski, Anna Piotrowska, Wlodzimierz Rybarczyk, Maciej Warszakowski (Poland) • Liliana Andrei, Elena Boghina, Viorica Beldean, Dan Dumitru Gheorghiade, Miruna Matache, Rodica Sandu, Stelian Stancila, Geanina Elena Suditu, Ana Maria Xantopol (Romania) • Vladimir Lunacek, Vladimir Mikus (Slovakia).

# Executive Summary

## Purpose of this publication

*Next Stop: Sustainable Transport* was prepared by the Regional Environmental Center for Central and Eastern Europe (REC) within the framework of the project on Promotion of Public Transport in Central and Eastern Europe. The project was financed by the Royal Ministry of Environment of Norway. The main aim of the project is to develop regional cooperation between public transport stakeholders in the EU's new member states and candidate countries in Central and Eastern Europe. Such cooperation enables sustainable public transport to be promoted in the region and addresses public transport problems in the framework of sectoral integration. It also builds the capacity of public transport companies and municipalities, and establishes dialogue between them, donors and financial institutions.

## Background

After a rapid loss of passengers from 1990 to 1995, varying between 15 and 25 percent in different countries, public transport in Central and Eastern Europe (CEE) entered a period of slowed decline in usage, with an average yearly decrease of between 1-3 percent. Urban areas in CEE are currently facing growing traffic congestion, road safety issues, and rising air and noise pollution. Policy decisions and actions are needed to encourage a modal shift from road to rail, the design and construction of multi-modal transport corridors, changes in the present practice of priority highway investments, promotion of walking and cycling, and many other measures introducing or implementing sustainable transport concepts.

Despite the financial constraints, CEE countries have made efforts to address public transport problems in recent years. Some of the larger cities have developed and adopted sustainable urban transport policies. Interaction and dialogue between competent authorities and public transport companies have improved, and the first steps towards increasing the efficiency of public transport have been made. Also, the renewal of public transport fleets has begun, city road infrastructure has improved, ring roads have been built, and new underground, tram and trolley lines have opened, been extended or are planned. However, in many other towns where populations still rely largely on public transport, many decision remain to be taken. If public transport does not improve quickly, the urban environment and health will deteriorate further.

This publication presents case studies prepared within the framework of the project and summarises their findings. The case studies were prepared by experts from Central and Eastern Europe and fall into two categories. Case studies on Sofia, Warsaw and Tallinn outline the status, needs and priority measures to support public transport in these cities. Case studies on Bucharest, Budapest and Vilnius cover the priority problems and needs of public transport financing.

Beneficiaries of the project are public transport stakeholders – that is, municipalities, public transport companies, governmental institutions, and non-governmental organisations interested in the operation, financing and reform of public transport. The goal is to move towards sustainable transport and integration of environmental, health and transport concerns into policy making. The process of project implementation showed the importance of building the capacity of local bodies in sectoral integration and sustainable transport measures. It demonstrated their willingness to exchange information, knowledge and experience, with the aim of achieving stable financing for public transport, making it accessible for all – in short, an attractive, environmentally friendly alternative to swelling car usage in the CEE region. Urban areas in CEE are currently facing growing traffic congestion, road safety issues, urban sprawl and rising air and noise pollution. Policy decisions and actions are needed to encourage a modal shift from road to rail, the design and construction of multi-modal transport corridors, changes in the present practice of priority highway investments, the promotion of walking and cycling, and many other measures introducing and implementing sustainable transport concepts.

A long-term process has only just begun, but the present situation offers unique potential and opportunities for public transport in CEE. Active international support for ongoing efforts to improve efficiency, quality and reliability of the public transport service, combined with good existing practices, could lead to a stabilisation of public transport passenger volumes and positive short- and medium-term development perspectives. The REC aims to support dialogue and cooperation between various interest groups and policy makers on local, national and pan-European levels, in search of solutions and offering support to those seeking a healthier environment though improvements to the public transport sector.

In the European Union, the approach to promoting the integration of environmental concerns during policy making was developed under the Cardiff Process. The Cardiff Process was initiated in 1998 to implement the provision of Article 6 of the Treaty Establishing European Community, which reads: "[E]nvironmental protection requirements must be integrated into the definition and implementation of the Community policies and activities."

Transport has been a part of the Cardiff Process since its inception, and the Transport Council submitted its strategy to the European Council in 1999. In June 2001 the European Council adopted the EU's Strategy for Sustainable Development: A Sustainable Europe for a Better World," which stresses the need for sectoral integration where economic growth, social cohesion and environmental protection must go hand in hand.

Transport congestion is identified by the strategy as one of the main threats to sustainable development. Accordingly, all policies should be judged on the basis of how they contribute to sustainable development, but better information is needed to achieve this goal.

The EU Common Transport Policy of 2001 tackles rising levels of congestion and pollution and encourages the use of more environmentally friendly modes of transport to prevent congestion. It also seeks the decoupling of transport growth from economic growth and the shift of modal splits in transport from roads to public transport – giving priority to infrastructure investment for public transport and integrated urban development strategies to avoid urban sprawl. The region's current public transport systems can serve as a solid foundation in this effort. Means of preventing congestion and providing sustainable mobility measures are discussed in the European Commission's white paper, "European Transport Policy for 2010: Time to Decide," published in 2001. This publication underlines the links between common transport policy, economic policy, land-use planning policy and town planning, social and education policy and local urban transport policy. It calls for "a new approach to urban transport by local public authorities with rationalisation of private car use."

## Key messages

The analysis of the state of public transport in the case studies reveals that changes are needed in the legal and institutional set-up of bodies dealing with public transport. This could involve the establishment of a public transport agency or association of public transport (regional, urban and railways) operators. The case studies point to unfair competition between private and public operators, with private operators not bearing the full costs of public transport infrastructure investments and maintenance. A need for integrated revenue collection, reimbursement for concessionary fares, and revenue allocation for public transport are also mentioned as priority problems. Other measures to promote public transport, fight air pollution and congestion in cities (e.g. the establishment of park-and-ride systems, bus lines, rehabilitation of tram tracks, metro system, light railways, eco-fleet investment) are touched upon.

The Bucharest and Sofia case studies detail the barriers to obtaining financing for pubic transport from international financial institutions, while underscoring the problems with loan guarantees and conditions. The importance of external and alternative sources of financing has been emphasised.

The case studies emphasise the importance of supporting local authorities and institutions dealing with public transport. The local governments were given responsibilities regarding the operation of and investment into public transport at the moment of political and economic transformation. However, such legal and institutional changes were not followed by capacity building and sufficient financial support. As the Bucharest case points out:

> [R]evenues cannot be balanced by full costs of public transport. Moreover, in order to evaluate efficiency, one must not consider benefits difficult to express in figures: the degree of air pollution, urban congestion, energy and fuel consumption, comfort and safety.

Therefore, employer transportation plans and charges for enterprises have been proposed in Bucharest case studies. The Budapest case study concludes with:

> [T]he challenge is how to achieve an acceptable balance between commercial concerns, raising the costs of public transport, decreasing shares of public transport use and social responsibilities of public transport, and, at the same time, remain competitive in the wake of rising automobile use.

Focus should placed on long- and medium-term investment planning and on the effective tendering of services, infrastructure construction or fleet rehabilitation. Integrated traffic management systems are badly needed in the cities surveyed for the benefit of transport operators and everyday users if public transport is to be made attractive and convenient. Currently the fleet in the surveyed cities is ageing. There is also a high loading factor of vehicles, thus making public

transport an unattractive choice to car users. It is even at risk of becoming a service to marginalised groups of society. Costs of ongoing or needed investments in public transport infrastructure and fleets are indicated in the case studies.

Pressure on city centres will continue because of motorisation followed by air and noise pollution and congestion, but traffic management measures, adequate urban planning and eco-friendly, adequately supported public transport can limit them.

## Next steps

During the preparation of the case studies and various discussions, several areas were identified for further work in the fields of capacity and institutional strengthening for the operation and financing of public transport, including:

- integration of transport networks to promote public transport (integration of public transport planning and land-use planning);
- private-public partnerships supporting public transport operation and financing;
- exchange of experience and information regarding the financial aspects of investments (including tendering, the role of subsidies, bearing the costs of infrastructure investments, additional financial sources, loan procedures, fare setting, integrated fare collection, concessionary fares, revenue allocation schemes and other charging schemes that promote public transport);
- an overview of EU funding processes and programmes, access to these funds and their programming for public transport projects (the importance of state aid regulations of the EC and the efficient use by public transport stakeholders of the EU Cohesion and Structural Funds need to be addressed);
- an overview of financial schemes supporting public transport in each EU new-member state and candidate country in CEE (based on the principle that the ordering party should pay for services);
- transport demand management measures, including parking policies and practices, pricing policies and the establishment of traffic restricted areas;
- development of information systems on public transport, marketing and promotion of public transport, user support with the use of electronic tools (the use of available information technology tools is needed for public transport reforms, improved decision making and management, etc.); and
- the need for raising the awareness of the public and decision-makers concerning public transport as an asset that contributes to sustainable development.

# Introduction

The project on Promotion of Public Transport in Central and Eastern Europe, supported financially by the Royal Ministry of Environment of Norway, was conceived to address the need for integration of environmental, health and transport issues during policy making through the promotion of public transport.

The project develops regional cooperation among public transport stakeholders in the new member states of the European Union from Central and Eastern Europe. Such cooperation is key to the development of sustainable public transport in the region and allows public transport problems to be addressed in the framework of sectoral integration. Activites are designed to build the capacity of public transport companies and municipalities, and to establish communication among them, as well as with donors and financial institutions.

This publication summarises six case studies prepared under the project, and seeks to identify common challenges, obstacles, needs and recommendations for the promotion of public transport in CEE. An overview of the case studies follows this introduction.

## The scope and structure of this publication

Three of the case studies – Sofia, Tallinn and Warsaw – present a series of respective public transport realities, needs and priorities, as identified by the experts: the information included is valid as of November 2003. The case studies of Bucharest, Budapest and Vilnius tackle priority problems and needs related to public transport financing in these cities: the information is valid as of April 2004.

The experts prepared these case studies in consultation with relevant municipalities, public transport companies and, if needed, other authorities or bodies responsible for public transport. The experts were advised to use and reflect on existing reports, assessments, analyses, strategies and available studies.

Case studies contain the following:

- a description of the current state of legislative, policy and institutional developments since 1989 in each described city, with respect to public transport (operation, maintenance, administration, financing of operations and investments, etc.);
- data on public transport in each city, including: operational network length in each city, number of lines per mode, number of trips, average stop distance, average speed per transport mode, current percentage of municipal budget allocated to public transport – distinguishing between operational and investment costs – revenue from tickets and revenue/cost ratios, and velocity/km ratios;
- sources used for public transport financing (state and municipal budgets, international financial institutions, available EU funds);
- economic instruments used to finance public transport (taxes);
- assessment of currently used procedures for public transport operation and financing (procurement, service contracts); and
- recommended legislative, policy and institutional measures to be taken to strengthen the capacity of public transport management, administrative operations or financing.

All six case studies, which were prepared by the experts, were subject to discussions by public transport practitioners from the region. Such discussions assisted in identification of the most urgent issues to be addressed while developing sustainable transport systems. The case studies served as the basiss for formulating site visits organised under the project. They also defined the scope of the organised meetings. The case studies address political, economic, environmental and financial aspects of public transport operation and investments.

The six case studies are followed by annexes with the conclusions of the December 2003 meeting and the back-

ground paper prepared for this meeting. The background paper, the first attempt to identify common issues among the project beneficiaries, set the stage for the project's activities Annex 3 outlines priority areas of work on the promotion of sustainable transport in CEE, chosen in consultation with project participants.

## Overview of project activities

The main objective of the first meeting under the project on December 16-17, 2003 was to present priority problems and needs of public transport in the capitals of EU candidate countries and new member states. Case studies were presented for Sofia, Tallinn and Warsaw. The participants investigated public transport management reforms in the other EU member states and identified directions for future activities to be undertaken under the project and beyond.

During the Fast Track to Public Transport workshop on public transport financing in April 19-21, 2004, participants discussed legislative, policy and institutional changes, financial sources and procedures used for investments and public transport operations. The discussions were based on case studies carried out in Bucharest, Budapest and Vilnius. An overview of public transport financing in Warsaw and Gdynia, Poland was also provided. The role of EU Structural and Cohesion Funds in public transport financing was presented, along with information about other sources of public transport financing, including international financial institutions.

A visit to Graz Municipality allowed participants to become familiar with the city's public transport system measures, financing and planning. The EU public transport programme, Trendsetter, and the URBAN II programme on urban development were discussed. The site visit was completed by paying a short visit to Graz's Mobility Center. During the second site visit, Budapest Municipality and its public transport company outlined the Transport Development Plan for Budapest, along with a system of subsidies, cost-recovery measures, operational contracts, procedures for the procurement of services, an informational system for public transport and international financing available to support environmentally friendly public transport.

Site visits to Krakow and Warsaw took place on September 9-11, 2004 under the Arriving at Sustainable Transport project. Representatives of the environment and transport sectors, public transport companies, municipalities and transport authroirites visited the Polish cities to discuss tools used for giving priority to public transport, cycling and pedestrians, stakeholder dialogue and accesst to EU funds for public transport in these cities. They also discussed the upgrade of tram networks and tram-fleet renewal in Krakow and Warsaw, and examined the policy-making process for local transport, systems of transport planning and traffic management, integrated ticketing, electronic ticketing and systems for fare collection in both cities.

The Stationed for Sustainable Transport workshop was organised by the REC to complement the Ministerial Conference on Environment and Health in Budapest, held from June 23-24, 2004. The event took place on June 21-22, 2004. Workshop participants represented the environment, health, and transport sectors (including national environmental health institutes, public transport companies, municipalities and NGOs active in the field). They discussed the impacts of transport on environment and health, as well as ways to support public transport and reduce the environmental and health risks of the transport flow in urban areas. They will discuss the integration of environmental, health and transport policy areas while drafting national sustainable development plans, clean technologies, information technology (IT) tools for effective public transport and traffic management, the Strategic Environmental Assessment Protocol and its sectoral integration applications.

The following aspects of transport, environment and health integration should be taken into consideration in policy making and implementation:

- the importance of providing society a full choice of transport modes, with emphasis on sustainable modes of transport such as attractive, accessible and efficient public transport, safe cycling and walking, as well as their integration;
- the impact of decentralisation of responsibilities in public transport, privatisation of public transport operations, and their consequences for successful implementation of sustainable transport policy;
- the importance of appropriate joint funding and financing (from a variety of sources such as the EU, international financial institutions, and national and local sources) for public transport, and conditions for safe cycling and walking to enable long-term policy implementation;
- the use of available information technology tools for efficient public transport and traffic management, better education, and increased public awareness and communication to improve and promote sustainable transport development.
- creation and support of an interdisciplinary network of stakeholders dealing with sustainable transport; and
- local-level capacity building on integrating diferent environmentally friendly transport modes and land-use planning.

For more information on the project, visit: <www.rec.org/REC/Programs/EnvironmentalPolicy/PublicTransport>.

# Overview of the Case Studies

Policy makers in Central and Eastern Europe must reorient their transport policies to give greater priority to sustainable development and to balance the growth of motorisation with the capacity to develop road infrastructure. In this vein, the following policy directions should be adopted:

- promotion of public transport;
- reduction of car use in urban areas;
- improvements to traffic management;
- promotion of non-mechanised means of transport (bicycles, walking);
- improvements to traffic safety measures; and
- integration of land-use and transport planning.

These trends are already reflected in policies adopted in Warsaw and Budapest. Bucharest, Tallinn and Vilnius still need both a general transport policy and a specific strategy to develop public transport.

It is crucial that financial resources are made available to implement transport policies in CEE capital cities. The most desirable option is that the state assists the municipalities through participation in financing of the most important capital-intensive public transport investment projects, such as underground or light rail systems, as well as local and regional development plans and programmes containing components such as roads, tunnels and bridges. None of the cities included in the study have this option, although Budapest, Sofia and Warsaw are better off than the others.

Bucharest has a policy guaranteeing social protection, which means that tariffs are approved by the state. The revenue from tickets covers only 30 percent of total costs, and the state is not able to subsidise public transport adequately. Sofia operates under a different policy, whereby the revenues from ticket sales cover 94-98 percent of the costs of transport operation. The implementation of social policy is left to the municipality and the state, which pay the full difference in price in the case of concessionary fares.

New legislative initiatives currently discussed in the Polish parliament will empower Polish municipalities with measures to generate financial resources for the development, maintenance and operation of sustainable transport systems. Parking charges have already been introduced in Warsaw. At the moment tolls for using bridges and entering city centres, and congestion pricing are being considered in the most crowded cities in Poland, including Warsaw.

## Summary of technical issues

With 1.2-2.0 million inhabitants, Bucharest, Budapest, Warsaw and Sofia are considerably larger than Vilnius and Tallinn (see Table 1). Although the last two are smaller, they still play a key role in stimulating their respective region's economical and cultural activity.

Transport infrastructure differs significantly from city to city, a result of their different characteristics, history and social habits. The four biggest cities have underground railways – in the case of Bucharest and Budapest there are four underground lines; Sofia and Warsaw have only one line each (under construction but operating) and other lines are planned. Vilnius and Tallinn have no underground at all.

**TABLE 1**

### Population of cities in case studies

| | Inhabitants |
|---|---|
| Bucharest | 2,000,000 |
| Budapest | 1,861,383 |
| Warsaw | 1,689,648 |
| Sofia | 1,220,000 |
| Vilnius | 553,200 |

Bus lines are the most developed mode of transport (see Table 2), making them the backbone of the urban transport system in all of these cities. Bucharest, Budapest and Sofia contain every mode of transport in use, including buses, trams, trolleys and underground. There are also periodic water connections in Budapest. Warsaw does not have trolley connections, but it has many more bus lines that create a relatively dense network. Vilnius's transport system is based on buses and trolleys, with a dense trolley network in the central district of the city.

All of the cities offer also some private taxies and minibuses as a means of transport, but except for Sofia and Vilnius, there is no reliable information on the number of connections realised per year.

Readers of the reports should note that different authors provided figures for the total length of lines that is significantly higher than the length of network, since lines frequently overlap. For example, in Warsaw:

- total length of the bus transport network: 849.1 kilometres;
- total length of the bus lines: 2,975.7 kilometres;
- total length of the tram transport network: 121.8 kilometres;
- total length of the tram lines: 469.8 kilometres.

Table 4 shows the number of passengers transported per year, per mode of transport in Bucharest, Budapest, Warsaw, Sofia and Vilnius. Unfortunately, no such information was provided for Tallinn.

It is worthwhile to note again that in the four biggest cities, buses constitute the core of the transport systems. In the crowded districts where there are no dedicated lanes, buses are frequently obstructed in the same traffic jam as private vehicles.

**TABLE 2**

## Number of lines per mode of transport

| | Bucharest | Budapest | Warsaw | Sofia | Vilnius | Tallinn |
|---|---|---|---|---|---|---|
| Bus | 123 | 153 | 201 | 95 | 62 | 53 |
| Tram | 31 | 33 | 31 | 16 | 0 | 5 |
| Trolleybus | 19 | 15 | 0 | 10 | 18 | 8 |
| Underground | 4 | 3 | 1 | 1 | 0 | 0 |
| Total | 177 | 204 | 233 | 170* | 161** | 66 |

* includes private carriers (48 lines)

** includes private operators (19 lines of buses and 62 lines of minibuses)

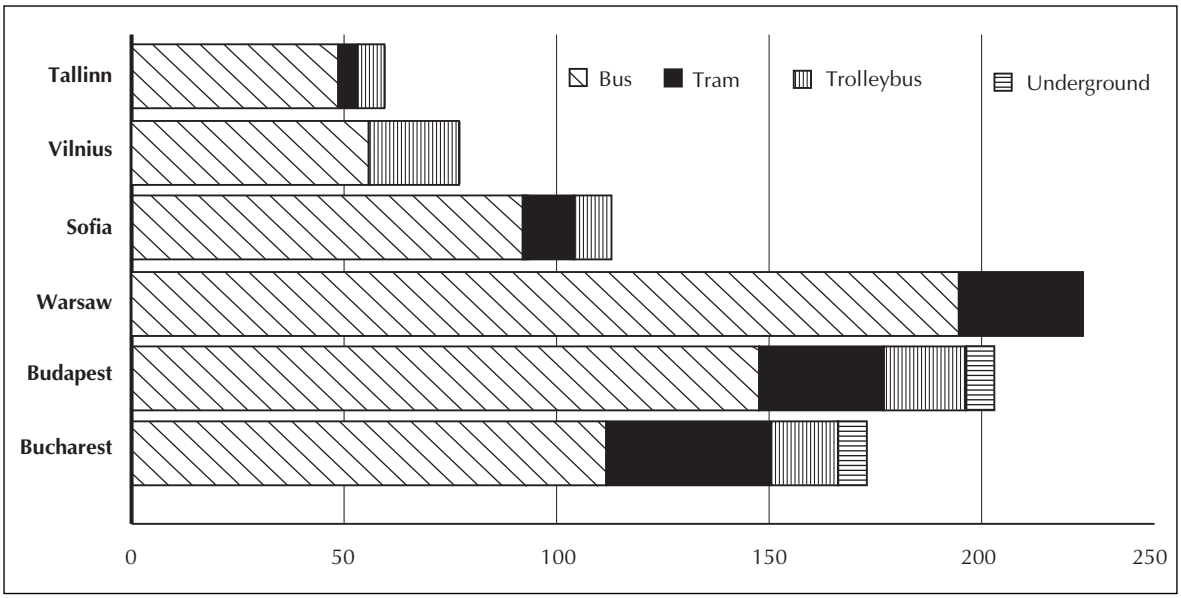


**TABLE 3**

## Operational network length in each city (in kilometres)

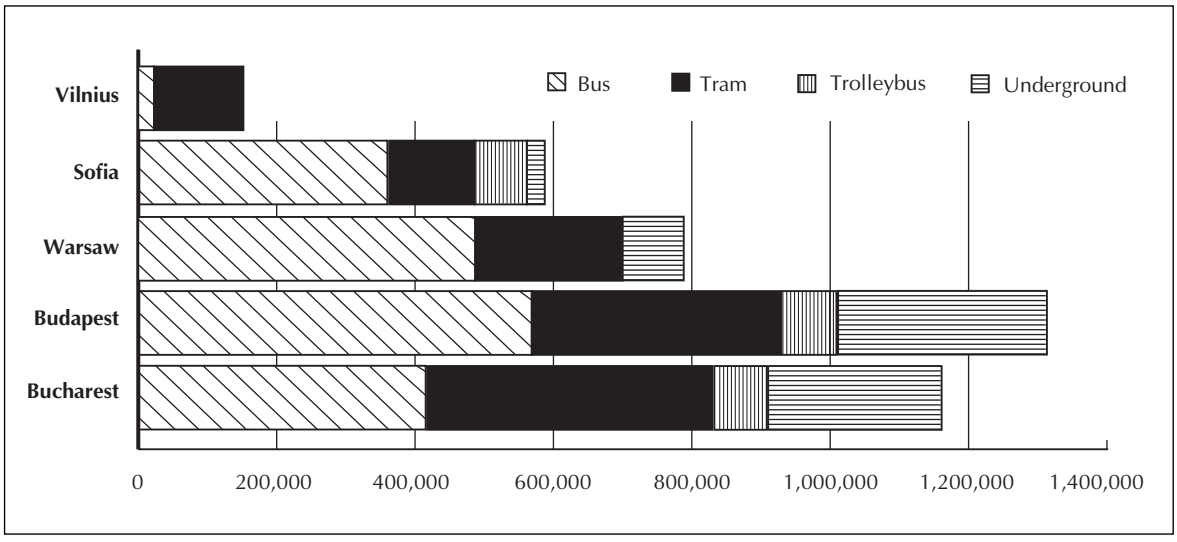
| | Bucharest | Budapest | Warsaw | Sofia | Vilnius |
|---|---|---|---|---|---|
| Bus | 430 | no data** | 849 | 1,250* | 710* |
| Tram | 146 | no data | 122 | 145 | — |
| Trolleybus | 74 | no data | — | 90 | 423* |
| Underground | 33 | 63 | 14 | 8 | — |
| Total | 683 | 1,133 | 985 | — | 1,133* |

* Total length of lines and not the length of the network **no data was provided in the case study

**TABLE 4**

## Number of passengers transported per year (in thousands)

| | Bucharest | Budapest | Warsaw | Sofia | Vilnius |
|---|---|---|---|---|---|
| Bus | 403,300 | 570,469 | 470,000 | 364,000 | 12,627 |
| Tram | 403,300 | 367,075 | 250,000 | 182,000 | — |
| Trolleybus | 89,600 | 81,853 | — | 82,550 | 136,793 |
| Underground | 250,000 | 315,046 | 70,000 | 21,450 | — |
| Total | 1,146,200 | 1,334,443 | 790,000 | 650,000 | 263,068 |




Looking at the operating fleet (Table 5), it is significant that in Warsaw there are many more buses than in other cites. Its network of express, semi-express and ordinary bus lines connecting to other modes, such as metro, tram and suburban train stations, has offered efficient service over the past few years. Unfortunately, there is no data on the transport fleet in Budapest.

The data available shows that the age of the operating

fleet is high and the replacement of many vehicles must be done in a relatively short period. This overhaul will be expensive, but the modern, low-floor cars with more economical and cleaner engines will certainly contribute to better services and reduce pollution levels.

The average distances between stops for each mode of transport are lower in the central districts and generally correspond to the standards set. Another quality indicator is the average speed of the type of public transport. The data available shows that those using the street network are slow and still uncompetitive with a private car. In Warsaw this velocity starts to increase after establishing bus lanes along principal communication routes. Keeping these lanes free of motorists during rush hours is the primary challenge.

## Summary of financial and economic aspects

Only the case studies of Bucharest, Budapest and Vilnius focus on the financing of public transport.

The current amount of municipal funding allocated for public transport has been provided for Bucharest (10 percent) and Budapest (32 percent) only. From the data provided it is clear that the Bucharest and Budapest municipalities do not cover the operational costs of public transport. After revenue from tickets is accounted for, gaps remain of about EUR 39 and 163 million, respectively.

The low cost of tickets in Bucharest requires substantial tariff subsidies. Generally, the municipality bears only 70 percent of the cost of a surface public transport trip. The subsidy received is between 72 percent and 82 percent of the total revenues.

### Financial sources

**Bucharest**

The financial resources of RATB (the surface public transport operator of the Bucharest municipality) include:

- revenues from tickets and monthly passes sold at RATB's own centres of sale (which represents approximately 30 percent of the costs);

**TABLE 5**

**Average operating fleet**

| | Bucharest | Warsaw | Sofia | Vilnius | Tallinn |
|---|---|---|---|---|---|
| Bus | 874 | 1,606 | 677 | 224 | 364 |
| Tram | 360 | 869 | 190 | — | 100 |
| Trolleybus | 200 | — | 157 | 258 | 126 |
| Underground | 251 | 108 | 48 | — | — |

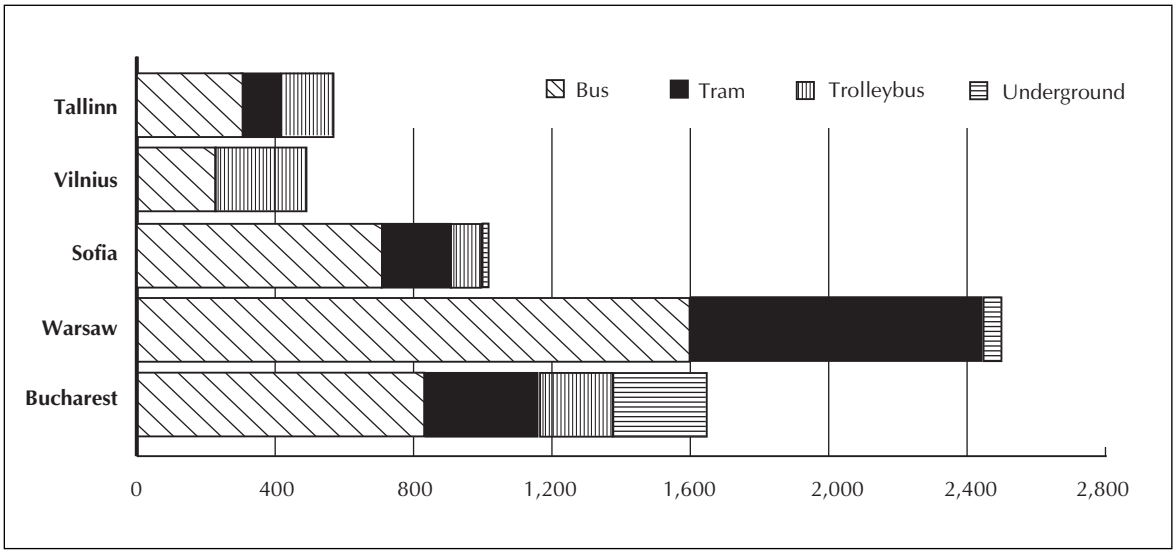


**TABLE 6**

## Average age of operating fleet (in years)

| | Warsaw | Sofia | Vilnius | Tallinn |
|---|---|---|---|---|
| Bus | 8 | 13.8-15.2 | 10 | 13.7 |
| Tram | 18.5 | 12 | — | 19 |
| Trolleybus | — | 14 | 13 | 13.7 |
| Underground | 5 | no data | — | — |

**TABLE 7**

## Average distance between stops (in metres)

| | Bucharest | Budapest | Warsaw | Vilnius |
|---|---|---|---|---|
| Bus | 529 | no data | 520 | 640 |
| Tram | 522 | no data | 456 | — |
| Trolleybus | 553 | no data | — | 550 |
| Underground | no data | 1,500 | 1,092 | — |

**TABLE 8**

## Average public transport speed (in kilometers per hour)

| | Bucharest | Budapest | Warsaw | Sofia | Vilnius |
|---|---|---|---|---|---|
| Bus | 16.0 | 16.3 | 17.8 | 19.4 | 23.0 |
| Tram | 13.3 | 13.3 | 15.0 | no data | — |
| Trolleybus | 11.6 | 11.6 | — | no data | 18.0 |
| Underground | no data | 23.8 | 36.0 | 41.0 | — |
| Total | no data | no data | no data | 24.0 | no data |

**TABLE 9**

## Operational costs per year, per mode (million EUR)

| | Bucharest | Budapest | Vilnius |
|---|---|---|---|
| Bus | 57.10 | no data | 13.82 |
| Tram | 47.72 | no data | — |
| Trolleybus | 16.80 | no data | 13.51 |
| Operational costs | 121.62 | 359.04 | 27.33 |

**TABLE 10**

## Annual ticket revenue (million EUR)

| | Bucharest | Budapest |
|---|---|---|
| Bus | 14.86 | no data |
| Tram | 14.79 | no data |
| Trolleybus | 3.28 | no data |
| Total | 32.94 | 134.51 |

**TABLE 11**

## Amount of municipal budget allocated for public transport (million EUR)

| | Bucharest | Budapest |
|---|---|---|
| Operations | 77.45 | no data |
| Investments | 21.39 | no data |
| Total | 98.84 | 62.84 |
| Percent of local budget | 32% | 10% |

- the tariff difference allocated by the local council, which is calculated in accordance with the methodological norms of the Ministry of Finance and represents the social protection offered to certain categories of citizens; and
- budget allowances to cover capital expenses, in compliance with the Law on Public Finances.

**Budapest**

Currently there are three main sources of operational revenue in the Hungarian capital:

- fare revenue;
- municipality operational compensation for concessionary fares; and
- government price compensation for concessionary fares.

**Vilnius**

Communication Services receive 4 percent of the revenue of single tickets sold on vehicles, and a share of 15 percent of all other tickets sold (e.g. monthly passes and single tickets sold in kiosks). Communication Services does not get a share of the compensation for concessionary fares. The enterprise received 66.6 percent of the income from tickets in 2002 and 65.5 percent in 2003. Other revenues were generated from parking and other commercial activities. After the share to Communication Services is deducted, the revenue is split between the Bus Company and the Trolleybus Company.

### Economic instruments

**Bucharest**

Economic instruments mentioned in the case study:

- obtaining financing from international financing bodies;
- lowering subsidies to 50 percent (this is possible only with further investments intended to reduce operational costs and improve the quality of service); and
- obtaining external financing such as loans for investments in infrastructure

**Budapest**

The case study describes two alternate financing sources:

- Public-Private Partnership Programme - encouraging private sector financing for the operation and the development of urban transport; and
- Polluter Pays – Parking Management Programme, consisting of park-and-ride facilities, new parking garages, and the establishment of pedestrian-only zones.

**Vilnius**

No economic instruments are discussed in the case study.

# Part 1
# Public Transport — Status, Priority Problems and Needs

# Sofia, Bulgaria

## General data

### Location, population

The historic city of Sofia is situated in southwest Bulgaria. The area governed by the Sofia Municipal Authority is 1,194 square kilometres, of which 245 square kilometres are populated territories, 510 square kilometres are agricultural areas, 40 square kilometres are covered by water and 467 square kilometres are forested. The area enclosed by the Sofia ring road is 198 square kilometres, of which 20.9 square kilometres are served by public transport.

The population of Sofia has changed dynamically, according to census data collected by the National Statistics Institute (NSI). It reached 1,177, 577 inhabitants in 2001, compared to 30,928 in 1887 and 1,182,698 in 1992. The number of temporary residents of the capital, such as students, commuting workers and foreigners is 150,000-300,000. Thus, the number of Sofia residents currently exceeds 1.4 million, which is approximately one-sixth of the total population of the country. In the coming five years no serious changes in population levels are expected. An NSI forecast of demographic trends foresees a stabilisation of Sofia's population at approximately 1.2 to 1.3 million inhabitants in 2030.

The population density of the capital has also increased from 826 people per square kilometre in 1980 to 918 in 1989 and to 1,050 in 2000. The latest figure greatly exceeds the country's average of 73.4. According to this indicator, Sofia is one of Europe's most densely populated cities, but the city is not overly compact due to disproportionally higher densities in some peripheral regions. The majority of inhabitants live in densely populated areas (73 percent in districts of more than 1,500 people per square kilometre). The average distance from the centre of the city is 4.4 kilometres per person at a deconcentration index of 1.15.1.

The capital is an attractive place to live because of comparatively low unemployment rates of 3.45 percent in 1998 and 4.47 percent in 2000, while the average rates for the country were 12.2 percent in 1998 and 17.9 percent in 2000. The city also offers better work opportunities and higher salaries. The average annual salary in Sofia was BGN 2,525 in 1998 (EUR 1 = BGN 1.94) and BGN 3,245 in 2000, which exceeded the average annual salary for the country by 13 to 15 percent (BGL 2,199 and BGL 2,856) respectively.

### Transport infrastructure

Transport infrastructure covers 21 square kilometres in all. The transport-communications system is built on the radial-circular principle, with distinct rings and incoming-outgoing highways. Large residential districts are connected to the central part of the city and industrial regions via several main diagonal roads. Some 75 to 80 percent of the total number of daily travellers in the city pass through the city centre.

This is a serious problem lacking a solution. The population outside of the ring road is serviced by Mass Public Urban Transport (hereafter, MPUT) and Bulgarian Railways (BDZ). The length of the road network is 3,400 kilometres, of which 422 kilometres are a main street network. Intersections are usually on a single level, although the infrastructure includes 66 pedestrian underpasses, two pedestrian overpasses and 28 automobile overpasses and underpasses. The busiest street crossings are equipped with traffic lights, 245 in all, of which 65 are connected to an automated management system (AMS). The remaining 180 are on local regimes. Traffic intensity is marked by clear morning and evening peaks, with traffic jams in the centre of the city. There are major problems in parking and stopping in the central part of the city, due to insufficient parking lots and garages. Traffic on the main street network is one-way, with the exception of Partiarh Evtimii Boulevard, V. Levski Boulevard and riverbank boulevards. Traffic on secondary streets in the centre is one-way. Access of heavy trucks and buses to the centre is restricted, except for the electrical transport of MPUT.

Sofia is Bulgaria's most important transport node in view of its role as the capital and its geographic location — a point where three trans-European corridors (4, 8 and 10) cross. These factors determine the high intensity of incoming and outgoing traffic, as well as the level of local and international freight and passenger traffic.

## Inter-city communications and traffic

Three main road connections cross the territory of Sofia:

- E79 and the Hemus motorway, running north-south;
- E80 and the Trakia motorway, running northwest-south-east; and
- E871 running east-west.

The average daily intensity of traffic in these sections of the National Road Network (NRN) is among the highest in the country:

- E79 (or I-1) between Sofia and Pernik – 28,888 vehicles per 24-hour period;
- Hemus between Sofia and Botevgrad – 14,000 vehicles per 24-hour period;
- Trakia between Sofia and Ihtima – 13,000 vehicles per 24-hour period;
- E80 (or I-8) between Sofia and Kalotina – 5,000 vehicles per 24-hour period; and
- E871 (or I-6) between Sofia and Pirdop/Zlatitza – 7,000 vehicles per 24-hour period.

The extensions of these NRN roads within town boundaries also form a part the main street network:

- Botevgradso Shosse (Vladimir Vazov Boulevard) and Tzar Boris III Boulevard (Gornobanki pat);
- Tzarigradsko Shosse (Plovdsivsko Shosse and Samokovsko Shosse); and
- Slivnitza Boulevard and Evropa Boulevard.

The latter group receives the major part of incoming and outgoing road traffic in Sofia and is often subject to traffic jams.

Transit freight and passenger traffic is diverted to the Sofia Ring Road (II-18) which has a total length of 61 kilometres and also takes part of the city traffic. The road is mostly single-lane, and its traffic capacity is largely exhausted. In some sections the average daily intensity varies between 10,000 and 20,000 vehicles.

Especially difficult is the situation at the south arc of the ring road, 20 kilometres of which pass very near or through the residential districts of Gorubliane, Mladost 4, Malinova dolina and Knyajevo.

Just as problematic is the situation along Gornobanki Pat (E79 and E871) where the Sofia Ring Road meets Vladaya. This section goes along the Vladaiska River, parallel to the Sofia–Pernik railway and through a limited space bordered by a densely built-up residential district. The road also takes urban traffic, MPUT routes (including tram lines), as well as incoming and outgoing road traffic, of which almost 50 percent is lorries.

Plans for the future development of Sofia's roads envisage:

- inter-city communications;
- reconstruction of the northern arc of Sofia Ring Road to motorway capacity; and
- construction of the 16-kilometre Ljulin motorway, which is to take transit traffic flow from the north and northwest to the south.

The elaboration of designs for these sites and a search for suitable financial sources are in progress.

## Intra-city street network

The street network of Sofia is 3,400 kilometres in total length and represents about 5.2 percent of the city's territory.

As defined in the Law on the Organisation and Zoning of Territories, the street networks of settlements consist of:

- a primary street network, which includes fast urban motorways (class I), urban motorways (class II), regional roads (class III), and main streets (IV class); and
- a secondary street network, which includes collecting streets (class V) and attending streets (class VI).

The basic carrier of mass public urban transport is the main street network. Its total length is 421 kilometres, of which urban motorways are 128 kilometres; regional roads 139 kilometres; and main streets 154 kilometres. The secondary street network directly serves residential areas and brings motor traffic to streets of higher classes.

The structure of the Sofia street network is radial-circular and reflects its historical development. In the central part of the city, which is also the historical centre, most of the streets are narrow and do not provide the appropriate conditions for MPUT traffic.

The innermost ring surrounds that part of the city which is accessible only by MPUT trams and trolleys. The ring is formed by Slivnitza, Skobelev, Patriarh Evtimmii and Levski boulevards. The primary, fast urban motorways of Tzarigradsko Shosse, Tzar Boris III, Botevgradsko Shosse and Slivnitza (Evropa) begin from this ring.

The second ring is formed by Konstantin Velichkov Boulevard, the recently opened extension of Dimitar Nestorov Boulevard (which has considerably eased northbound and southbound traffic from the west side of the city centre) and Bulgaria Boulevard. The next ring is formed by Jitnitza Street and Gotze Delchev, Vaptzarov, Yavorov and Sitniakovo boulevards. The fourth runs along Todor Kableshkov and G. M. Dimitrov boulevards, and the outermost ring is the Sofia Ring Road.

The rings mentioned above are currently incomplete, but the radial-circular concept for Sofia's infrastructure development is the basis of elaboration for the capital's new general transport-communications plan (with 130 separate transport zones), which is to replace the old master plan from 1961.

### Physical restrictions on development and expansion

The only possibility for urban development is to the south of the city toward Vitosha Mountain. The northeast part is not suitable for residential areas because of its proximity to the industrial site at Kremikovzi. Only technical crops may be grown here. Westward expansion is not acceptable either, because the city's development would occur at the expense of fertile agricultural lands, which is prohibited by law.

### Motorisation

Sofia saw its first automobile in 1896. The number of vehicles registered by the end of 2000 in the capital was 494,496, of which 90 percent were personal cars. For the past 10 years the total number of registered motor vehicles has increased nearly four-fold. From some 150 vehicles per 1,000 inhabitants in 1990, the ratio reached 600 vehicles per 1,000 in 2000, which is considerably greater than the national average (see Figure 1). This avalanche-like increase in motor vehicles in Sofia creates enormous difficulties. The existing transport network can barely handle the increased traffic, which requires major capital investment to keep up with the rate of expansion. This is virtually impossible.

An important feature of the automobile fleet is the high average age: passenger cars are 15-16 years old. The fleet increases by about 7,000 new cars each year in Sofia. The trend is toward stabilisation of the number of vehicles in the next few years, because a considerable number of old vehicles will be disposed of. Another reason for a decrease in the average age is that more new vehicles will be purchased.

## MPUT organisation

MPUT has a 100-year history. January 1, 1901 is considered the beginning of organised public transport in Sofia. On this date, six tramway lines with 23 kilometres of single track serviced by 25 tramcars and 10 trailers were officially opened.

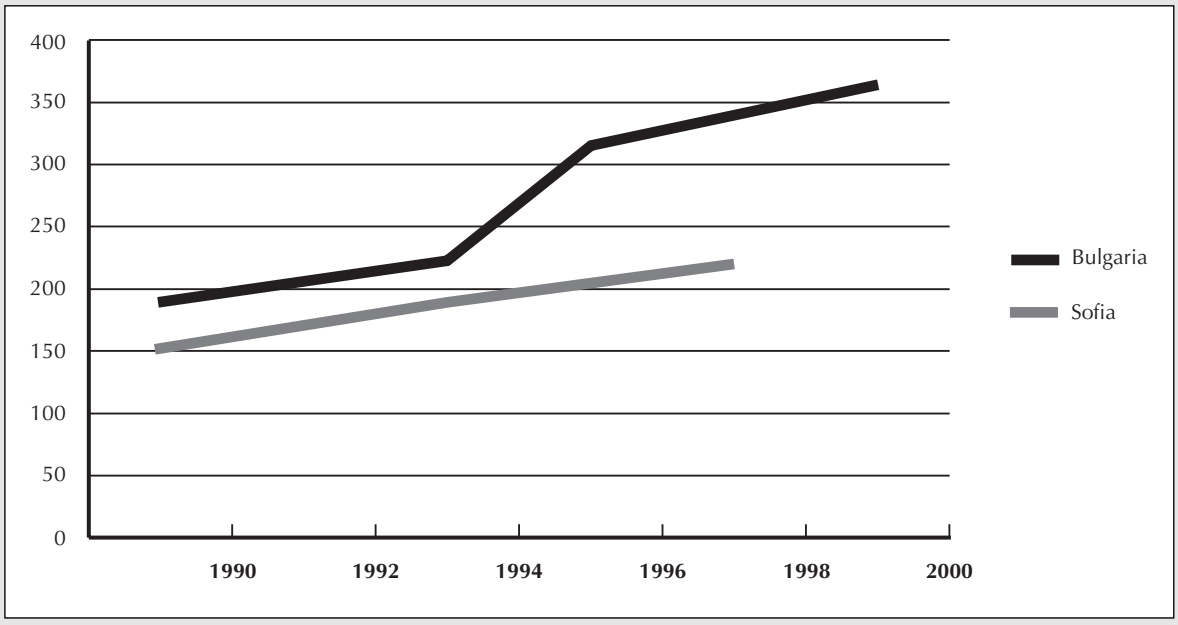
Today MPUT deals with the following modes of transport — tramways, trolleys, buses and the underground railway. Tram lines make up the backbone of the transportation network, but the largest share of routes and passengers are serviced by bus transport. The total length of the MPUT network is 1,500 kilometres, including 1,250 kilometres of bus lines, 145 kilometres of tram lines, 90 kilometres of trolley lines and 8.1 kilometres of underground.

MPUT is the primary mode of transport for the capital's population. About 85 percent of those travelling within the city use MPUT, which is a clear indication of the system's socio-economic significance.

Some 2,385,000 trips on public transportation are taken each weekday — 650 million trips per year. Tramway transport consists of 16 lines, along which 190 tram units run daily, servicing 28 percent of total trips in Sofia. Trol-

**FIGURE 1**

**Number of passenger cars per 1,000 inhabitants**



ley transport consists of 10 routes with 110 trolleys, which service 12.7 percent of total daily trips. There are 95 bus routes with 677 buses, which cover 56 percent of total daily trips (including 47 percent in the centre and 9 percent in the suburbs). The underground is 8 kilometres long and has seven stations connecting the district of Lulin to the centre of the city. It uses 10 metro units and services daily 3.3 percent of total trips. These are the main types of public transport in Sofia.

In 1999 a supplementary transport mode with minibuses, called "route taxis," started in Sofia. Currently, 48 lines operate with 26 private carriers and daily use of 357 route taxis. Their services represent 90,000-95,000 trips on weekdays.

### Authorities and their responsibilities

The Sofia Municipality runs MPUT for the capital and its suburbs. The municipality bears political responsibility for properly managing this significant public service. The authorities at various levels of regulation and their functions are presented in Figure 2. The main representatives of MPUT's institutional framework and their major functions are:

At the strategic level, the Sofia Municipal Council is responsible for the following:

- determination of strategies for the development of public transport;
- approval of annual budgets for MPUT (transport responsibilities for all operators);
- approval of financing compensation to MPUT for its preferentially tariffed tickets;
- tariff policies;
- approval of programmes for investments in transport communications;
- planning and coordination of transport on municipality territory; and
- announcement of tenders for transport services.

The permanent commission for transport, infrastructure and traffic safety is responsible for the following:

- legislative initiative for proposals on transport policy.

At the tactical level, the Transport Directorate is responsible for the following:

- tendering;
- issuing licenses for supplementary route operations, taxis, incidental and special transport, inter-city and inter-district transport;
- coordination of changes in MPUT routes; and
- coordination of projects for the permanent organisation of traffic.

Also at the tactical level, SKGT-Holding AD is responsible for the following:

- central realisation and allocation of revenues, management of the ticket system;
- analysis, control and evaluation of operations;
- financing and allocation of compensation among transport operators;
- surveys concerning MPUT and travel demands; and
- centralised specialised services such as marketing, road information, advertising and consulting services.

At the operational level, transport operators consist of the following:

- SKGT Autotransport (bus transport);
- SKGT Electrotransport (tram and trolley transport);
- Metropolitan AD (underground transport); and
- private bus operators (public transport of passengers along detached MPUT bus routes).

These operators are responsible for the following:

- management and control of service quality; and
- maintenance and repair of the vehicle fleet (rolling stock, catenary, railway, etc.).

## Legal framework

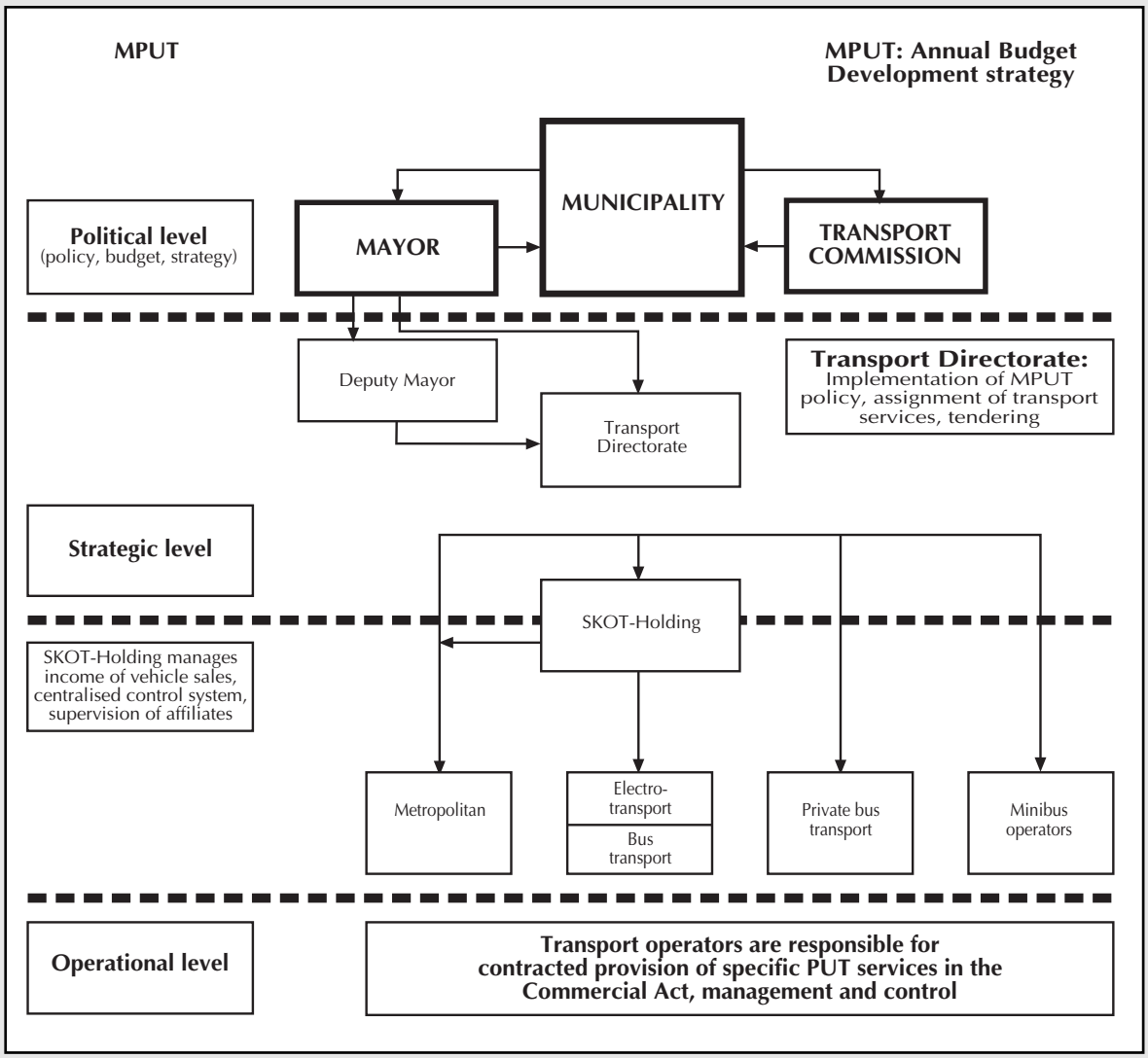
The legal and regulatory framework that determines the activities of MPUT in Sofia consists of several significant normative documents:

Related laws include the following:

- Local Government and Local Administration; published in the State Gazette (SG), No. 77/September 17, 2001, amended No. 1/January 1, 2001;
- Municipal Property, published in SG No. 44/May 21, 1996, amended No. 34/2001;
- Public Procurement, published SG No. /June 6, 1999, amended No. 97/November 28, 2000;
- Road Traffic, published SG No. 20/March 3, 1999, last amended No. 1/January 4, 2000;
- Roads, published SG No. 26/March 29, 2000, amended No. 111/December 28, 2001; and
- Environment Protection, published SG No. 86/October 18, 1991; amended No. 1/January 2, 2001.

**FIGURE 2**

## MPUT organisational structure




Related regulations include the following:

- Regulation 33 on public transport of passengers and freight on the territory of Bulgaria;
- Regulation on passenger transport and conditions for travelling via MPUT within the territory of the Sofia Municipality, which was approved by the Sofia Municipal Council in Resolution 36, Protocol 8/March 14, 2002, amended by Resolution 1, Protocol 10/April 4, 2000, amended further by Resolution 3, Protocol 11/April 27, 2000;
- Regulation of the proper public use of transport within the territory of the Sofia Municipality established in Resolution 1 by Protocol 33/July 28, 1993, amended with Resolution 3 by Protocol 13/June 26, 2000; and
- Regulation on public passenger transport along routes supplementary to the municipal transport network within the territory of the Sofia Municipality, approved by the Sofia Municipal Council in Protocol 55/March 8, 1999, based on Article 21, Article 22 of the Law on Local Self-Management and Local Administration (LLSMLA), item 6 and 11 from Regulation 33.

The Law on Municipal Property regulates the statutes of municipal companies as entities specialised in satisfying the needs of the population and ensuring the execution of municipal activities and the related supply of goods and services, including transport services. The Municipal Council approves the annual budget of municipal companies.

SKGT Holding AD, SKGT Autotransport AD, SKGT Electrotransport AD and Metropolitan AD are commercial companies with municipal property and owned by the Sofia Municipal Council (100 percent of SKGT Holding, and Metropolitan and 66 percent of the daughter companies Autotransport and Electrotransport).

According to LLSMLA, the Sofia Municipal Council may take decisions on reorganisation, make changes in capital structure, determine system- and management structures, and define transport functions and the conditions for transporting passengers. The mayor may exercise these rights on behalf of the SMC.

Under the regulation on passenger transport, the SMC determines the prices and conditions under which the transport operators of MPUT perform passenger transport by tram, trolley, bus, underground and other means of transport. The execution of passenger transport is assigned by the Sofia Municipality to SKGT Holding AD, which organises the transport of passengers for MPUT. It assigns to different transport operators the execution of these services via various modes of transport or detached parts of the MPUT network.

## Annual budget, financing

The Sofia Municipality determines the economic framework of MPUT regarding responsibilities, costs and revenues.

The responsibilities of transport fall within the following parameters:

- annual kilometre run;
- fuel consumption per kilometre run (specified by route network);
- stops;
- vehicles (in sufficient numbers and in adequate condition);
- traffic intervals;
- route length;
- kilometre run;
- number of tours; and
- hours of service operation.

The costs of activities are determined from calculations on expenses, such as operation, salaries, maintenance and repair. Capital investments and the creation of SKGT Holding, its daughter companies and Metropolitan are provided separately by the Sofia Municipality and are not included in the above budget.

The sources of revenues are the following:

- ticket sales (handled centrally by the Centre for Revenue Realisation [CRC] and at service points by transport drivers);
- the Sofia municipal budget (compensation for preferential travel by Sofia Municipality); and
- the state budget (compensation and subsidies).

Sofia Municipality compensates operators for so-called "social trips," which include free-of-charge travel for pensioners, the disabled, and children and adults with debilitating injuries travelling with a companion. Sofia Municipality also pays for discounted trips for pensioners and students. The state budget subsidises the travel of war veterans and officers disabled during service. It also subsidises the travel of certain employees from various institutions such as the tax administration, the Ministry of Internal Affairs, the Sofia army garrison, Parliament, the State Automobile Inspection and the Bureau of Investigation. The total amount depends upon the funds approved by the ministries of internal affairs, finance, education and justice.

In 2001 revenues from ticket sales amounted to 61.2 percent of the total. The CRC represented 51.2 percent; companies 10 percent. The Sofia Municipality provided compensation equal to 34.1 percent of total revenues; subsidies from the state budget provided 4.7 percent.

The total costs for transport activities exceeded total revenues by 6 percent.

The principle that "the sponsor of preferentially tariffed tickets must pay the full amount of the price for travel" is a basic concept of the present mechanism for balancing the costs of transport activities with revenues from the services provided. Data for the period after 1998 shows that the implementation of this principle has worked: revenues from sales cover 94-98 percent of the costs of transport activities. Thus, it is fair to say that MPUT operations are no longer subsidised. The social function of MPUT and implementation of social policy are the responsibility of the municipality and the state, and are no longer transferred to commercial companies.

## Ticket prices

Sofia Municipal Council sets ticket prices and the general tariff policy. MPUT tariffs are fixed and specific, and cover single-trip tickets, daily passes and a large variety of other passes. There are also several free passes and discounts. The framework of MPUT in Sofia sets the price of a single-trip ticket at BGL 0.40 for all types of transport (bus, tram, trolley and subway) independent of location, distance travelled or time elapsed. In this sense there are no differential tariffs. Ticket prices for public transport are always a touchy subject.

The recommended formulation of price (based on the market principle for an economy in transition) is still diffi-

cult to apply with regard to MPUT in Sofia. However, pricing methods have changed considerably during transition under the recovery programme and the transformation of operational divisions into commercial companies. This difference is definitely a decisive step towards the financial stabilisation of public transportation services.

The formulation of a unit price is pursuant to the principle of balancing activity costs with service revenues. After evaluating expected costs for services and estimating the annual number of trips, the price for a single trip is determined by dividing the total cost by the total number of trips. A price calculated according to this method allows the anticipated revenues from ticket sales to cover activity costs. In this case, a preliminary calculation of necessary, inherent costs is the basis for sound price formulation and for following basic market principles.

As far as municipal support for MPUT in the capital is concerned, this is a serious matter for the SMC. The council pays 12-14 percent of its annual revenues in compensation for preferentially tariffed trips.

The capital costs for vehicles and transport infrastructure are a substantial budget item as well – the amount of which varies greatly, depending on investment programmes over a given period. From 1998-2000 the funds for this purpose represented 20-24 percent of the total self-generated revenues of the municipality (in addition to loans and foreign financing sources).

## MPUT system management and control

Management and control of MPUT operations are performed by the Central Dispatching Centre (CDC) and its divisions – the dispatching centres for the management of bus, tram, trolley and underground transport.

There is no unified, automated system for traffic management (ASTM) for the whole MPUT. Bus transport is managed entirely by an ASTM based on radio communications. Tramway transport at Iskar depot is part of an ASTM based on global positioning system (GPS) communications (see Annex 1). Summarised information from all modal dispatching centres goes to the CDC. MPUT is in extreme need of an ASTM covereing the entire system's transport process.There is a proposal to augment coverage of the ASTM from Iskar depot to other tramway depots, then to include trolleybus depots and replace the bus system's currently operating ASTM.

### Bus transport

Bus transport services on MPUT routes are provided by the municipal company SKGT Avtotransport AD, and private operators as well.

### SKGT Avtotransport AD

SKGT Avtotransport AD is an affiliate of SKGT Holding, which owns 34 percent of total shares. The remaining 64 percent are held by Sofia Municipality. The current structure of the company includes the operational divisions AT1 Zemliane, AT2 Malashevtci, AT3 Drujba and AT4 Republica.

### Fleet structure and production programme

The number of route lines operated by SKGT Avtotransport was 99 in 2000, 97 in 2001 and 95 in 2002. The total length of bus routes within the last three years is between 1,100 and 1,250 kilometres.

The bus fleet operated by SKGT Avtrotransport numbers 817 buses in all, of which 566 are articulated. According to the operational plan for 2002, the number of buses operated daily on MPUT routes and providing support activities (repair and personnel services) is 677. The company operates 92 single buses for non-MPUT services (i.e. tourist services). The bus fleet structure can be seen in Table 1.

The average operational speed of MPUT bus transport for the year 2001 was 19.4 kilometres per hour.

Notwithstanding fleet renewal during the last few years, the average age of fleet vehicles is still high: 13.8 years for articulated buses and 15.2 for single buses.

Since the second half of 2001, three of the company divisions perform transport services on MPUT routes and one for non-MPUT services. Total company transport activity, measured in kilometres run and actual operational costs of diesel fuel, can be seen in Table 2.

### Programmes and measures to reduce harmful emissions from SKGT Avtotransport buses

The SKGT Avtotransport programme for the reduction of harmful impact on the environment caused by MPUT buses comprises a gradual operational withdrawal of old, obsolete bus brands like the Ikarus 280 and Chavdar 11G5.

The programme is focused on the following:

- fleet upgrading with buses that are compliant with European legislation on harmful emissions from engines;
- use of alternative gas fuels for obsolete engines, mainly for the Ikarus 280 buses (the first projects were carried out in 1990-91); and
- replacement of obsolete power units with new ones meeting EURO1 and EURO2 requirements (the first projects were carried out in 1994).

Since 1992, under projects financed by the Sofia Municipality and the Ministry of Environment and Water (MEW) through the National Fund for Environment Protection (NFEP) and funds from European Union pre-accession programs 57 percent of the available bus fleet has been replaced and modernised, namely through:

- modernisation of the engines of 294 Ikarus 280 buses, of which 234 are equipped with engines of the type D1OUTS 150/155E1, and 60 with compressed natural gas, diesel combustion appliances;
- purchase of 183 new Mercedes and MAN buses; and
- procurement of 207 recycled Mercedes series 0305 buses and compliance with the requirements of EURO 0 and EURO1.

Practically 82 percent of the available SKGT Avtoransport bus fleet meets the requirements of EURO1.

Although the projects on reduction of the environment pollution caused by bus transport were initiatied in 1988-1989, intensive programme implementation started in 1994.

Within the period 1994-2000, 478 Ikarus 280 buses with engine type 2156 HM6 and 246 Chavdar 11G5 buses were withdrawn from operation and replaced by new Mercedes and MAN buses and used Mercedes type 0305 (G) buses compliant with EURO1.

In 2001, compared to 1994, the total annual kilometre run of bus transport services decreased by 14 million kilometres (about 21 percent) due to the start of underground operations and structural changes in the public urban transport network. This further reduced the harmful emissions by bus transport.

The environmental standards of the old, renovated and new bus engines are given in Table 3. The structural changes and renovated power units of the bus fleet allow the buses with EURO1 standards to travel near zones in the city centre. The company's goals are that, within the next two years, all buses meet EURO1 requirements and at least 40 percent of them meet EURO2.

Table 4 shows the quantities of harmful substances emitted by bus transport in 2001, and the quantities expected if the annual kilometre run had been performed with the buses used in 1994 — i.e. if replacement and renovation had not been accomplished.

The partially performed efforts to replace and modernise the fleet allowed the reduction of quantities of emitted harmful substances by more than 35 percent and the reduction of carbon oxides and hydrocarbons by more than 200 percent.

Additional reduction of emissions has been achieved as a result of less fuel consumption per unit transport work, as well. Old buses consumed 27.1 grams per passenger-kilometre, and the new buses consume 17.8-20.0 grams per passenger-kilometre — about 30-40 percent less.

Future measures (within two years) for bus transport emission reductions will reuire that all Chavdar 11G5 buses be put out of operation and replaced by new buses compliant with EURO2 requirements. The company's plans envisage an increase of CNG usage in buses and industrial needs. The main goal is to reduce consumption of light- and heavy-liquid fuels.

All buses not meeting EURO1 and EURO2 requirements are slated to be taken out of operation over the next four years. Especially disturbing for the city's environment is the fact that Sofia absorbs about 70 percent of the inter-

**TABLE 1**

## Bus fleet structure

| Bus brand | Availability (number) | Average age (years) | Average distance travelled (kilometres) |
|---|---|---|---|
| Ikarus 280 | 338 | 15.13 | 949,435 |
| Mercedes 0305G | 127 | 18.01 | 1,059,307 |
| Mercedes 0345G | 41 | 4.02 | 179,867 |
| Chavdar 141 | 30 | 6.00 | 308,100 |
| MAN SG 262 | 30 | 3.67 | 137,999 |
| Chavdar 11G5 | 71 | 14.24 | 748,369 |
| Mercedes 0305 | 74 | 18.99 | 990,872 |
| Mercedes 0302T | 25 | 9.00 | 631,330 |
| Mercedes 0345S | 36 | 0.16 | 10,702 |
| MAN SL (D) 200 | 6 | 19.00 | 755,758 |
| MAN SL 232 | 21 | 4.05 | 197,161 |
| Ikarus (solo) | 18 | 14.98 | 886,649 |
| Chavdar 11M3,M4 | 76 | 15.22 | 845,268 |
| Others | 16 | 13.76 | 736,427 |

**TABLE 2**

## KGT Avtotransport transport activity

| Indicators | 1999 | 2000 | 2001 |
|---|---|---|---|
| Actual distance travelled, in kilometres (km) | 60,039,940 | 57,530,428 | 54,517,950 |
| Actual fuel consumption, in litres | 25,465,479 | 23,866,289 | 21,978,909 |
| Actual fuel consumption, in litres/100 km | 42.41 | 41.48 | 39.89 |
| Actual consumption of lubricants, in litres | 227,760 | 191,746 | 60,996 |

**TABLE 3**

## General technical and environmental indicators of old, renovated and new modern engines

| Technical environmental indicators | Values of environment indicators, grammes/kilowatt-hour | | | | |
|---|---|---|---|---|---|
| | EURO 1 standard | EURO 2 standard | Old diesel engine* | Old gas-diesel* engine** | Modern engine*** |
| CO | 4.50 | 2.40 | 11.37 | 4.02 | 0.61 |
| $CH_4$ | 1.10 | 1.10 | 5.12 | 1.17 | 0.36 |
| $NO_X$ | 8.00 | 7.00 | 14.30 | 5.26 | 7.43 |
| Particles | 0.36 | 0.15 | 0.55 | 0.15 | 0.13 |

Notes:
* engine D 2156 HM6u
** engine D 2156 HM6u equipped with CNG combustion appliance
*** new modern engines

city bus transport services performed, according to the national transport scheme. Every day, 1,000 buses enter and leave the vicinity of the central part of the city. An adequate solution for the problem of bus stations is still to be found.

### Private bus operators

The first open public procurement procedure to assign an operator for MPUT requirements on 16 detached bus lines was announced in 2001. The tender is based on the Law on Public Procurement, Regulation No. 33 of MTC for Public Transport Haulage, and the Regulation of the Sofia Municipal Council for MPUT Passenger Haulage in Sofia. The assignment is for a five-year period, and it defines the route line, schedule, timetable and transport task for the annual kilometre run. The tender price of fuel consumption per kilometre is offered by the transport operators and is approved with the assignment. Payment is based on consumption for the actual distance travelled in kilometres (kilometre run) and the approved price.

The level of haulage prices for different types of tickets (including season tickets) and conditions for MPUT usage are specified by the Sofia Municipal Council in accordance with the regulation for MPUT passenger haulage on the territory of Sofia municipality.

Bus characteristics and relevant requirements depend on the specific route line. According to ranking methodology, applicant evaluations are based on set criteria and a scoring system. Concerning vehicle age, buses more than 10 years old are not allowed to be used. The environmental requirements are very strict as well, based on Regulation N 33, Chapter 3. Buses with engines covering EURO2 and EURO1 standards score higher.

Three of the seven private operators assigned to certain detached route lines are in operation. One company, Carat C, operates two route lines using eight Mercedes Benz 0345 buses, of which seven are on line — representing a utilisation

**TABLE 4**

## Annual emissions by buses in 1994 and 2001 (in tonnes)

| Emission | 1994 | 2001 |
|---|---|---|
| CO | 4,565.7 | 2,127.9 |
| $CH_4$ | 2,177.0 | 1,124.8 |
| $NO_X$ | 5,756.3 | 4,782.5 |
| Particles | 226.3 | 177.0 |
| Total | 12,725.3 | 8,212.2 |

Note: The calculation of emissions in grams per kilometre is based on an average operational speed of 18.5 kilometres per hour.

ratio of 87.5 percent. Eridantrans operates two lines with 13 Den Oudsten buses, of which 11 are on line with a utilisation ratio of 84.62 percent.

SKGT Avtotransport is assigned as external operator of 26-kilometre Line 111, serviced by 27 Mercedes 345S100 buses. The expected total annual kilometre run included in the transport responsibilities for private bus operators is 9.954 million kilometres, which represents an impressive 19 percent of the total kilometre run of total bus transport. The fact that these are relatively long routes should be taken into account, however.

The opening of the transport market to private operators and tender-based service assignments are also movements toward the incorporation of market principles and mechanisms into MPUT in Sofia.

# Electrical transport

## Tram transport

The total length of the existing tram network in Sofia is 209 kilometres, of which 169 kilometres are single track with a gauge of 1,009 millimetres, and 39 kilometres of single track with a gauge of 1,435 mm.

Some 536 tram turnouts are in operation, of which 244 are on open-air tracks and 292 are in tram depots. The length of the tram catenary network is 277.5 kilometres.

Vehicle distribution by type of tramcar and depot by December 31, 2001 is presented in Table 5.

The utilisation ratio of the vehicles in tram transport is rather low at 58.54 percent for the first quarter of 2002. This underscores the great necessity to overhaul a large part of the vehicles, as well as the high level of defectiveness.

## Overhaul necessity for rolling stock

For trams with a gauge size of 1,009 millimetres and the established norm of 120,000-150,000 kilometres, the number of vehicles in need of overhaul is 47 vehicles (or, 18 percent). The most common type of tram car is the T8M-730 (76.9 percent), which has grown obsolete: most of these cars have been overhauled five times or more. For those trams with a gauge size of 1,435 millimetres, the overhaul necessity rate exceeds 57 percent. This concerns mainly those cars manufactured in Germany.

SKGT Tramcar has begun repairs on Czech tramcar types T6A2 and T6B5.

Bulgarian trams require modernisation due to their high rate of defectiveness. It is expected that, within a three-year period, up to 90 Bulgarian trams will be renovated. Renovation consists of overhauling management (electronic), brake systems and interiors. The mono-articulated trams are lengthened with a middle low-floor section, equipped with an automatic platform for wheelchairs.

## Rail track

Tram tracks are an important and indivisible part of urban electric transport, and the appearance of the city depends on tram tracks to a great extent. The world trends in this field are:

- construction of tram tracks with anti-vibration and anti-noise elements, which will provide more comfort for passengers and greater peace of mind for local residents (such types of track are especially adapted for streets with mixed-vehicle traffic); and
- construction of detached tracks upon which tram traffic acts independent of other traffic, and with traffic lights giving priority to tram traffic.

While detached tram tracks are appropriate for peripheral residential areas (both environmentally and financially), it is extremely important for the city centre that the old tram tracks be replaced with the type creating less noise and vibration. For this reason, 35-40 kilometres of old track need replacement within the next three years.

For the period 1990–1998, substantial changes in quantity and quality of tram track reconstruction have not been

**TABLE 5**

## Vehicle distribution

| Gauge (mm) | Type | Depot | | | Total tram cars |
|---|---|---|---|---|---|
| | | *Crasna Poljana* | *Banishora* | *Iskar* | |
| **1,009 mm gauge** | | | | | |
| | T8M – 730 Sofia70 | 13 | | | 13 |
| | T8M – 300 BG 1300 | 11 | 15 | | 26 |
| | T8M – 700M | | 38 | | 38 |
| | T8M – 503 | | 1 | | 1 |
| | T6M – 400 Sofia 100 | 36 | 21 | | 57 |
| | T6M – 700 | | 55 | | 55 |
| | T4D – Cz(D)74 | 18 | | | 18 |
| | T6A2 – Czech Republic | 57 | | | 57 |
| **Total 1,009 mm** | | **135** | **130** | | **265** |
| **1,435 mm gauge** | | | | | |
| | T6M – 400 | | | 1 | 1 |
| | T6MD – 1000 | | | 24 | 24 |
| | T6B5 – Czech Republic | | | 37 | 37 |
| | T4 – 201 Germany | | | 2 | 2 |
| | T4 – 205 Germany | | | 9 | 9 |
| | T6 – 231 Germany | | | 10 | 10 |
| | T8 – 401 Germany | | | 7 | 7 |
| | P4 – 280 Germany | | | 9R | 9R* |
| **Total 1,435 mm** | | | | **90+9R** | **90+9R** |
| **1,009 mm gauge** | | | | | |
| | Training T6M – 400 | 1 | | | 1 |
| | Total training | 1 | | | 1 |
| | Tram cars | 136 | 130 | 90+9R | 356+9R |

*R= repair work

reported. Since 1998, a lot of reconstruction work has been done (e.g. along the boulevards Christo Botev, Maria Luisa, Alabin Street, Scopie Street, Haidut Sider Street, Voskressenie Boulevard, Cherni Vrah Boulevard between Kosharite and Hladilnika, Tzar Boris III Boulevard between Shipka Station and Knjagevo), which has considerably improved the condition of tram tracks.

### Trolleybus transport

The total length of the existing trolleybus network is 257 kilometres. The length of the trolleybus catenary network is 205.7 kilometres. The number of trolleybus routes was 10 in 2002, and services were carried out by 157 trolleybuses.

Vehicle distribution by December 31, 2001 by type of trolleybus and by depot is presented in Table 8.

The utilisation rate of the vehicles of trolleybus transport was 72 percent for the first quarter of 2002. This is an indicator of the necessity for urgent replacement with new vehicles in order to operate the route lines normally. This does not preclude the need for vehicle overhaul, considering that 75 percent of the vehicles are between 12 and 18 years old. The distance traveled by the vehicles exceeds 600,000 kilometres. Most have already had one overhaul, but these should take place at least once every 200,000 kilometres. ZIU-682-type trolleybuses are the main problem. They are obsolete, in poor condition, and 91 percent of them must be overhauled.

**TABLE 6**

## Trams: age distribution

| | |
|---|---|
| Up to six years | 17 (4.7 percent) |
| Between 6 and 12 years | 105 (28.8 percent) |
| Between 12 and 18 years | 141 (38.6 percent) |
| Between 18 and 24 years | 58 (15.9 percent) |
| Over 24 years | 44 (12 percent) |
| **Total number** | **365** |
| **Average age** | **12 years** |

**TABLE 7**

## Rolling stock distribution of tram cars by distance travelled (by thousand kilometres)

| | Up to 150 | Up to 300 | Up to 450 | Up to 600 | Up to 1,000 | Up to 1,000 | Total |
|---|---|---|---|---|---|---|---|
| **Trams** | 59+2R | 31+7R | 12 | 104 | 126 | 24 | 356+9R |

*R – Underwent repairs*
Cars not overhauled: 98
Up to three overhauls: 171
Up to five overhauls: 76
Over five overhauls: 20

For the last 12 years, only three new vehicles have entered into operation — two of them in 1990 and one in 1997. A programme for recycling the fleet of Ikarus 280T trolleybuses and their renovation is underway.

### Metro

The reason for the start of metropolitan construction in Sofia is the sharply increased need for high-speed, off-street MPUT transport. First, high-density road traffic and narrow streets have led to sharp reductions in MPUT speeds (less than 15 kilometres per hour during peak hours and less than 10 kilometres per hour in the centre of the city). Second, due to the fact that large residential areas are located away from the centre, substantial passenger traffic flows are generated between the peripheral and central areas. Third, air pollution is increasing to unacceptable levels because of thickening traffic and traffic jams.

According to the general plan of metro lines adopted by the Council of Ministers, Sofia's metropolitan area follows the design of a classical, diametrical-type scheme for towns with 1.5-2.0 million inhabitants. The underground is planned to consist of three lines, which will cross and form a triangle in the city centre to form key metro stations at Sveta Nedelja Square, St Kliment Ohridski near Sofia University, and a third in front of the National Palace of Culture. The length of the first line connecting the three residential complexes — Obelja, Ljulin and Mladost — will be 21 kilometres with 17 metro stations. The length of the second line, running from Hladilnika to the National Palace of Culture and on to the Central Railway Station and the Nadejda residential complex, will be 18 kilometres with 16 metro stations. The third section between Kniajevo and Poduene will be 16 kilometres long with 15 metro stations. The total length of metro lines will be 52 kilometres with 48 metro stations. After completion of the final construction stage, the metro will serve over one million passengers per day.

The passenger-flow capacity of MPUT ground transportation along the planned metro lines reaches 30,000-40,000 passengers per hour, with the passenger flow along the first metro line being the largest. Only the metro has the capacity to provide high-speed transport services for such passenger flows (up to 50,000 passengers per hour) while tram, bus and trolleybus transport have smaller capacities — 5,000 and 4,000 passengers per hour, respectively. For example, the trip duration using the existing ground transport between Ljulin and the centre is 40 minutes during peak hours, but is only eight minutes by metro. The current average trip duration between Ljulin and Mladost is 90 minutes for peak hours and, according to the metro schedules, is expected to fall to about 18 minutes.

## Operational scheme

According to the underground plan, the first line to be constructed is that with the largest passenger flow — the residential areas Ljulin and Mladost with the central part of the city. The first section, between Ljulin and K. Velichkov Boulevard, with a length of 6.5 kilometres and served by five metro stations, has been in operation since January 28, 1998. Metro station 6, located between Opalchenska Street and Christo Botev Boulevard, entered into operation in September 1999; and metro station 7 (Serdica) is located at Sveta Nedelja Square and was opened in autumn 2000. The section between Ljulin and Obelja, with a length of 1.8 kilometres, was put into operation by the end of 2002. Thus, the inhabitants of two of the largest peripheral residential areas of about 150,000 people will be 15 minutes from the city centre.

The general operational characteristics of the metro are the following:

- 11 available metro units with four coaches;
- total availability — 48 coaches, manufactured in Russia 1990-1991;
- operational speed — 90 kilometres per hour;
- average traffic speed — 41 kilometres per hour;
- average distance between stations — 1,100 metres;
- passenger capacity — 50,000 passengers per hour;
- traffic intervals — five minutes during peak hours and seven minutes for non-peak hours;
- minimum possible interval between sections — two minutes;
- hours of operation — 05:12 until 23:21 from MS7;
- costs per kilometre run — about BGN 10; and
- annual distance travelled — 760,000 kilometres.

The metro has become a part of daily life for the capital's inhabitants, and the number of trips by metro has grown continuously, especially after stations 6 and 7 opened in the city centre. The number of trips was 1,666 million in 1998, 2,811 million in 1999, 11,910 million in 2000 and 20,851 million in 2001.

## Supplementary minibus route lines: route taxis

Passenger route transport services started in 1999 after adoption of a Sofia Municipal Council regulation concerning supplementary route lines. The assignment of public passenger transport services on supplementary routes is tender-based, and the procedure is in accordance with requirements of the Law on Public Procurement and the regulation of the

**TABLE 8**

### Trolleybus distribution

| **Type** | **Depot** | | | **Total** |
|---|---|---|---|---|
| | *Iskar* | *Nadejda* | *Levski* | |
| Ikarus – 280T | 56 | | 3 | 59 |
| Ikarus – 280T | | 41 | 44 | 85 |
| ZIU 682 | 1 | 3 | | 4 |
| ZIU 682 | | 4 | 3 | 7 |
| TC – 130 | | | 1 | 1 |
| ZIU – training | | 1 | | 1 |
| **Total** | **57** | **50** | **50** | **157** |

| **Age composition** | |
|---|---|
| Up to 6 years | 1 |
| Between 6 and 12 years | 0 |
| Between 12 and 18 years | 156 |
| Between 18 and 24 years | 0 |
| Over 24 years | 0 |
| **Total** | **157** |

Note: The average age of trolleybuses is 14 years.

**TABLE 9**

## Trolleybus distribution by distance travelled (in thousand kilometres)

| | Up to 200 | Up to 400 | Up to 600 | Over 600 | Total |
|---|---|---|---|---|---|
| **Trolleybuses** | 4 | 3 | 32 | 118 | 157 |

Vehicles not overhauled: 8
Up to one overhaul: 118
Over one overhaul: 31

Sofia Municipal Council for passenger transport services on supplementary route lines. The principle is that the municipality defines routes and timetables, while stops are by passenger request. Ticket pricing is based on market principles, depending on supply and demand. This is a matter of competition between the different operators, and the municipality does not interfere with price regulation.

When elaborating the process of route approval, the following factors are taken into account:

- Traffic should not be overloaded.
- The routes should not copy MPUT routes to any great extent.
- Routes in capital areas should either improve transport where MPUT is insufficient or provide completely new connections.

For the right to perform passenger transport services, each operator pays the municipality a monthly fee per bus in operation. The contracts are valid for three years (expired in July 2002). There is a proposal to extend the term by two years and then establish a five-year contract period. The initial number of route lines was 34 in 1999, 46 in 2000, and 48 in 2001.

At the moment, 26 private operators run 48 supplementary route lines within Sofia, using 357 minibuses with a capacity of 16+1 passengers. The buses are of different brands and models, namely: Ford-Transit, Peugeot-Boxer, Citroen-Jumper, Renault-Master, CIA-Prejio, a small number of IVECO, and various types of Mercedes – all of which are equipped with diesel engines – and GAZ-2705s (45 in all) with petrol engines and liquid propane gas appliances. All of the minibuses are equipped with a catalyser and meet EURO2 standards. Some meet EURO3 standards.

The fleet distribution by age is as follows:

Passenger requirements related to the urban transport service are, to a great extent, met by the options offered by the system of route taxis, which are vehicles with low capacities and costs. They are fast, easy to handle, relatively environmental and capable of accessing small city streets.

These transport services have entered the capital's MPUT system very quickly, and are especially welcome for fast trips over long distances without the need to change modes of transport. The minibus system currently serves 90,000-95,000 people per day, which represents about four percent of total weekday trips.

The approximate number of private-operated vehicles in Sofia is:

- Up to one year: 40
- Up to two years: 42
- Up to three years: 260
- More than three years: 12

The average operational speed is about 23-25 kilometres per hour.

# Vision for MPUT development

The long-term strategy and the major part of the Sofia Municipality's programme for public transport in the capital are related to the construction of its underground railway. The most environmentally friendly form of transport, it complies with the requirements of noiselessness, safety, ambient air purity, traffic capacity and comfort, while at the same time curbing city sprawl.

## Metro

In a number of governmental decisions the "metropolitan" has been announced as a project of national significance and a top priority in the programmes for economic assistance to the Republic of Bulgaria rendered by international financial and bank institutions.

Rapid extension of the first metro line towards the Mladost residential area is envisaged to ensure effective transport service to the capital and connections of western and eastern passenger flows along the metro line.

Sofia's environmental situation has deteriorated sharply in recent years. Mass urban transport is one of the major polluters – contributing particulate matter and more than 200 harmful substances and toxic emulsions into the ambient air. The established average annual concentration levels of dust in the air in the east-west direction (coinciding with

the first metro line) for the past 10 years have reached 0.36-0.41 milligrams per cubic metre (mg/m$^3$), which is far above the maximum admissible concentrations (MAC) of 0.15 mg/m$^3$. Lead aerosol concentration in the air, measured along the same route, is 0.0008-0.0014 mg/m$^3$ — several times higher than the MAC of 0.0003 mg/m$^3$. The forecasts and calculations show categorically that once the first line is set in operation, the concentration of dust and lead aerosols along the track will diminish MAC levels. This will be a serious breakthrough in bringing the environmental situation in the capital under control. A final report of the environment impact assessment, which was elaborated and approved by the High Council to the Ministry of Environment and Waters Final Report, clearly proves the environmental advantages of the metropolitan compared with other modes of urban transport.

The first metro line is situated along the most populated part of the city and will serve more than 45 percent of Sofia's residents (about 550,000 people). With the present street network and numerous routes of MPUT, the rate of motorisation in the town in the near future (the next four to five years) will make the central part of the town (the "centrum") impassable. It is envisaged that inter-city buses to the eastern and western suburban areas should stop at the end metro stations.

According to the drafts for MPUT traffic organisation (after the first metro line is set in operation with incomparably better conditions for comfort and safety), the metro will take passengers directly from three tram lines over a length of 30 kilometres; 10 bus lines over 150 kilometres; and five trolleybus lines over 65 kilometres. This makes 250 transport units in total. When the wagon fleet is available for the whole metro line, the total cost of withdrawal of the transport units listed above amounts to more than USD 20 million.

Furthermore, complimentary routes will be organised to bring passengers to the metro. In this way, the city will be subject to fewer means of transport.

Because of faster travel times, a daily average of more than 150,000 man-hours can be saved after the first line is set in operation (or, roughly USD 7.5 million per year, as calculated according to the methodology of the European Bank for Reconstruction and Development).

The new metro fleet of 48 wagons has a longer term of serviceability (25-30 years) than the other urban transport. This term of serviceability of the rolling stock leads to savings of more than USD 12 million.

Besides a decrease in the number of transport units of MPUT, the first metro line is also an important factor of urbanisation because of the expected build-up of modern infrastructure along its route.

## Tramway transport

The increasing orientation towards tramway transport seen in many countries, including the United States, is due to its exceptional advantages, namely:

- environmental friendliness — fewer emissions of harmful gases and noise following the introduction of new technologies;
- speed — detached/separate tracks with automatic management of traffic lights;
- comfort — present technical developments create comfort for passengers comparable to that of cars; and
- safety — availability of signalisation and on-board computers minimises driver error.

The main course of tram transport development in Sofia is the gradual introduction of trams with normal 1,435 millimetre gauge in the east-west direction, thereby replacing 1,009-millimetre-gauge tram lines. Adopting the same type of tram network used in the rest of Europe has many advantages. Purchases of whole vehicles and spare parts from European countries, for example, become much less costly.

Another important issue for the long term is the construction of high-speed tracks to connect more remote residential regions with the central part of the city.

For the purposes of renovating and modernising rolling stock, possibilities are being explored for an independent means of production (or through a joint venture with a foreign company) of a modern low-floor type of tram with platforms for wheelchairs.

## Trolleybus transport

Environment-friendly transport will continue to be a significant consideration for future MPUT development in Sofia. There are two aspects of future development — the route network and the rolling stock. The changes in the trolleybus network will correspond with the concept of "bring-to-metro" transport, as well as an internal one for districts along the track. A programme for more serious innovation foresees a change of situation for the rolling stock, which is overworked, obsolete and utilised well below its real capacity. Various possibilities are being investigated. An idea has also emerged to have Russian debt to Bulgaria partially paid off with trolley buses for Sofia MPUT.

From a technological point of view, the electro-buses powered by autonomous electric traction (batteries) and independent from a stationary catenary network, will have prospects for greater distances in future.

## Bus transport

Buses are the most popular mode of transport in Sofia and in the near future will maintain this role. Regretfully, bus transport is also the biggest polluter of the environment, and the course of its future development within the MPUT framework is directed toward reducing its environmental impact.

Sofia Municipality and the Ministry of Environment and Waters (MEW) have joined efforts relatede to environmental protection of the capital.

These efforts include:

- using diesel engines in compliance with minimum EURO1 standards for recycled "second hand" buses (for the currently available fleet of Ikarus buses, a programme to replace engines at major overhauls that includes improved combustion processes produced by Hungary-based RABA, which meet EURO1 standards;
- using natural gas as an alternative fuel and continuing a programme to use engines working on a mixed CNG-diesel regime by fixing a combustion appliance with CNG under high pressure (the development of this programme envisages delivery of compressor modules for CNG for refilling CNG-equipped buses);
- studying alternative fuels such as bio-fuels, which are usable in Mercedes HDI engines and work on a mixed diesel-rapeseed (coleseed) oil regime (some investor interest has emerged for implementation of the idea, initially for the needs of taxi transport and later for MPUT buses equipped with such engines. Construction of a plant for production of bio-fuel near the town of Lom is also being considered);
- strictly controlling emissions by implementing a modern diagnostic apparatus to measure and limit harmful substances in exhaust gases, power sources, oil consumption, etc. through a computerised system; and
- reorganising routes to correspond to the concept of "bring-to-metro" transport and to limit bus access as far as the second ring.

### Monorail

One idea for the distant future is the possible realisation of another type of transport – a monorail set on columns along the riverbeds of the Slivnitza and Perlovska rivers. The idea is to provide quicker connections with radial MPUT routes without going across the centre. This is an extremely environmentally friendly mode of transport. Its realisation can be by a catenary network (as with electrical transport) or by a draw-bar pulled cable on the principle of cable lines. The municipality's Architecture and Urbanisation Directorate is studying possibilities for the track. Foreign investors have shown an interest in the project.

### Implementation of an automated system for traffic management and control (ASTMC) in MPUT operations

The present system of control for MPUT transport processes is not sufficiently effective and does not allow for operational and prospective decisions to be made concerning its organisation and management. It is envisaged that the ASTMC, along with GPS communications now used in the Iskar tram depot, will be applied to include the rest of the tram depots and trolleybus lines. This would replace the current radio communications system in bus transport, and thus to spread to all MPUT operations.

Implementation of ASTMC for management and control of the transport process is aimed to ensure improvement in the quality of MPUT service. Besides achieving increased regularity of traffic and exercised control in real time, the system would allow recording and control of trips, route loads and consequent optimisation, would minimise driver error and make it possible to include private transport operators in the system. Implementation of a new system for charging and obtaining information from passengers in MPUT transport units would allow the development of a flexible tariff policy, based on the assessments of customers using the transport service.

Major directions for development of the whole transport system of Sofia include:

- development of a new Master Transport Communication Plan of Sofia;
- development of a programme for gradual improvement of the transport fleet with a goal of reaching a ratio of 35:25:40 for the passengers of the three ground transport types – tram, trolley and bus transport;
- accelerated renovation of the transport infrastructure, the socket and catenary cable network, improving stations, repair and maintenance facilities and equipment; and
- accelerated innovation of the rolling stock by importing new units and producing Bulgarian units through a system of joint companies for transfer of know-how.

## Priority problems and needs related to more effective MPUT operations

### Implementation of ASTMC in Sofia

There is a strong need for implementation of an effective computer-based system for management, dispatching and total control of Sofia's traffic. The establishment of a centre for management with respective computer equipment and software, based on dispatching trunk systems on the principle of cellular phones, working with geo-stationary satellites and monitoring traffic in real time, would make the dispatching process extremely flexible and decrease the number of traffic jams, schedule violations, fuel waste, etc. In spite of the comparatively high value of investments in such systems with GPS communication (about USD 10 million), they are paid off in a very short time sometimes within three to five years.

## AISTM implementation

The system used at the moment is not sufficiently effective, does not cover the entire MPUT network and does not provide the possibility for operational and perspective decisions to be made concerning MPUT organisation and management. Implementation of a new system for charging and obtaining information from passengers in MPUT transport units would allow for the development of a flexible tariff policy based on the assessments of customers using the transport service. An expected result of introducing such a system is a drop in the number of free-loading passengers from 8.5 to 6.0 percent – about 18 million trips annually.

## Metro construction priorities

With the construction of the second metro section from Sveta Nedelja Square to Mladost complex, the first metro line would service more than 45 percent of the capital's population (about 550,000 people), and other routes of MPUT would be closed down. With the comfort and speed of the metro service, and easy access to the centre, the metro is expected to attract people now using private cars. This would further ease the problems of heavy traffic, traffic jams and parking in the central part of the city. The track-road of the second section of the first metro line goes from stop 7 (Sv. Nedelja Square) to Tzar Osvoboditel Boulevard-Sofia University, the Dragan Tzankov Tunnel, Interpred-Vartopo Bridge and Mladost complex over a total length of 11.2 kilometres and nine stations. The phases of construction are:

Phase 1:
Metro station 7, Dragan Tzankov Tunnel, length 2.4 kilometres

Phase 2:
Metro station 9 – metro station 13, Denitza, length 5.7 kilometres

Phase 3:
Metro station 13 – metro station 16, Mladost complex, length 3.2 kilometres

The construction technologies of the different sections allow concurrent as well as consecutive construction, depending on the financing provided. According to the Sofia Municipality programme, the construction of the sections included in phases 1 and 2 is to take place up to 2007. Phase 3 and the start of work on the second north-south section between the National Palace of Culture and the Central Railway Station are envisaged after 2007. The necessary funds are found in Table 10.

Funding for the metro is based on resolutions of the Council of Ministers, according to which the metropolitan, as a site of national importance, is financed from the state budget. In recent years the Sofia Municipality has also participated in funding, especially renovating neglected engineering infrastructure and the construction of new infrastructure and the boulevard above the metro track. In view of the considerable amount of funds needed, possibilities are being investigated to acquire support and assistance from foreign financial institutions and to encourage participation from foreign investors.

## Priorities for effective operation of the urban transport communication scheme

The main priorities related to creating an effective urban transport communication scheme include:

- construction of infrastructure for traffic reorganisation and finalisation of ring construction as part of the transport communication scheme; and
- construction of parking lots, areas and garages to free the centre of cars.

## Major projects executed with national and municipal funds

Since 1992, 294 Ikarus buses have been modernised as part of the Innovation and Modernisation of the Available Bus Fleet programme of the Sofia Municipality and Ministry of Environment and Waters (MEW) through the National Fund for Environment Protection (NFEP) and EU Pre-Accession Economic Programme Fund (EUPAEPF). Some 234 of the total were provided with new engines and 60 with CGN-diesel combustion appliances. From 1994-1999, with funds from NFEP, 151 RABA-type D10 UTS engines were purchased. They comply with EURO1 standards.

Funds from the Phare Programme and NFEP were used to purchase 33 engines in 1997-1998, and another 50 engines complying with EU standards were bought in 2000 with the financial support of Phare. Thus the share of buses with renovated engines is 55 percent. Roughly calculated, the annual ecological effect from replacement of only one engine type D 1256 HM 6 U with D 10 UTS is the contribution of 9.7 tonnes less harmful substances into the ambient air.

The 60 buses, equipped with CNG-diesel appliances (also with the financial support of Phare and Sofia Municipality), represent another 15 percent of all Ikarus buses. They not only have an environmental effect, but save diesel fuel as well.

With funds from Sofia Municipality and EUPAEPF during the period mentioned above, a total of 187 new Mercedes and MAN buses and 204 recycled buses of various types, brands and conditions were purchased.

## International support and assistance in projects

In 1994 the European Commission and Directorate for Regional Development (Brussels) supported a survey called "The State of and Perspectives for MPUT in Sofia." A detailed assessment was performed regarding the technical

**TABLE 10**

## Funds needed for development

| Section | Value (in USD million) |
|---|---|
| *First metro line* | |
| Phase 1: Sv. Nedelja Square-Interpred | 107 (including interest) |
| Phase 2: Interpred-Denitza | 68 |
| Phase 3: Denitza-Mladost 4 complex | 45 |
| *Second metro line* | |
| Central Station-National Palace of Culture | 140 |

and technological characteristics of MPUT operations with respective short- and medium-term recommendations.

In 1997 the Phare Programme led an effort for financial recovery of the Sofia MPUT company, SKGT. The recovery programme concentrated on the company's survival over a short-term period of two years and focused on financial results.

In 1997-1998 the Phare Programme implemented a plan for the institutional development of MPUT in Sofia. Subject to options and recommendations are: institutional restructuring, the level of MPUT regulation, implementation of market principles, organisation, management and financial systems.

A direct result of FRP and PID is the reform of the SKGT's holding structure by establishing SKGT-Holding and the daughter companies Avtotransport, Eletrotransport, Avtoremont, Tramcar and Trans-remontstroy under a Sofia Municipality Council resolution dated July 28, 1997.

### Current cooperation with sponsors (on a bilateral basis) and international financial institutions

- On May 12, 1999 the Sofia Municipality issued its first Eurobonds at a total value of EUR 50 million placed on the Luxembourg stock exchange. The bonds earned 9.75 percent interest with a maturity of three years. The deadline for the pay-off was June 2002. Almost 80 percent of the funds collected were used for fundamental replacement of road infrastructure in the capital and major overhaul of the main boulevards.
- On February 6, 2002 a contract was signed between the Sofia Municipality and the Japanese Bank for International Cooperation and Assistance to provide a loan for the metro construction from Serdika to Interpred. Construction of the section is to be completed by the end of 2006. The loan is for USD 104 million, with a grace period of 10 years. The term of payment is 30 years at 2.2 percent interest. The loan is guaranteed by the state.
- Sofia Municipality is negotiating a loan with the EBRD aimed at renovating the rolling stock of MPUT in Sofia. The total amount is EUR 35 million. The funds are intended to be utilised within a two to three year period for the following:
  - modernisation of Bulgarian-made tram cars;
  - delivery of 20 trolley buses;
  - delivery of 49 buses; and
  - implementation of ASTMC in MPUT.

## References


Botev, Christo. "Transport Problems in the Capital City." Inteviewed on National Radio. December 2000.

*Capital Newspaper*. May 1999. June 2000. June 2001.

Chakarov, Georgi (head of Transport Directorate), Diankov, Mr, and deputy heads of SKGT Avtotransport and SKGT Elektrotransport. Interviewed by author.

Mateevich, Erhard (deputy mayor of Sofia). Speech given at the Urban Electrical Transport 2000 conference.

Mateevich, Erhard. Report on "Mass Urban Transport: Structure, Current Situation and Development."

Naidenvo, Vassil (head of SKGT Holding). Speech given at the Urban Electrical Transport 2000 conference.

Naidenvo, Vassil. Interviewed by author.

Phare. Reports on the Financial Recovery Programme of SKGT. 1197.

Phare. Reports of the Plan of the Institutional Development of Public Transport in Sofia: 1997-1998. Phare project under the Framework Transport Contract. Main consultant: GOPA.

*Regulations of the Sofia Municipality Council on Public Transport on the Territory of Sofia*. March 14, 2000.

*Statistical Notebook of Sofia*.

Strategy for Development of Sofia. Preliminary report. March 2001. Working group led by Margaret Talvitz, Robert Bucley and Sasha Tzenkova.

"The Transport in Sofia." Programme on 2001 Television. Feb. 19, 2001.

Transport Directorate within the Sofia Municipality Council and SKGT Holding. Annual reports and programmes. 2000-2001.

# Appendix: System for Traffic Management and Control

The current system for traffic management and control in MPUT is fragmentary and does not cover the whole MPUT network.

There are two different automated systems for traffic management in operation. One is used in SKGT Avtotransport to monitor bus transport. The other is in the Iskar tram depot . Their main features are explained in more detail below:

## Bus transport

The gradual construction of an automated system for the monitoring and control of bus transport began after experiments in AT Drujba and AT Malashevci more than 10 years ago. The basis of the system is the use of automated code devices (ACD) in the buses and automated control points (ACP) along the track. The information is registered when the vehicle passes by the ACP and is scanned in the dispatching centre (DC) of the corresponding bus division (there are four DCs for each of the bus divisions). In a 150-metre zone around the ACP, the driver of the vehicle can make voice contact with the DC dispatcher. Thus, in real time, the dispatchers are able to monitor traffic and react according to the situation. Depending on the software products developed and used, the incoming data can be summarised, stored and analysed. The summarised data is then transferred to the Central Dispatching Centre of SKGT-Holding at the main dispatcher's disposal.

The system includes all four bus divisions of Avtotransport and covers 100 percent of the buses from public transport, including the private bus operators who run detached bus route lines from the MPUT transport scheme.

At present this "old" system is functioning successfully. The current reality is such that without the implementation of this system, bus transport could not operate normally.

## Tram transport

For the needs of tram transport, an experimental tram line was initially equipped with a new system for control and management of the operation process.

A combined system is being used comprising GPS-positioning and a two-channel radio station for voice information and dispatching digital data. The GPS system for positioning transport objects is used one-way, i.e. free of charge. Positioning is achieved with the help of a special plate for specifying the vehicle's coordinates. Each tram is equipped with an on-board device – a computer and a two-channel high range radio station. Information is sent to the dispatching centre every 10-15 seconds. The digital data do not interfere with the radio voice connections.

Various extras. such as the automatic announcement of stops and the memory card for fluid crystal signs – with two lines of 16 symbols each displaying schedules are supplied together with the on-board device modules.

The next element of this system is the dispatching centre, for which there is no need for automated coding points along the track.

This system allows for monitoring and managing traffic, as well as collecting and summarising various data and information for garage administration. Part of this software was developed by specialists who are well-acquainted with public transport operations. Currently, all Iskar trams (all German/Czech production-fit for the standard gauge of 1,435 millimetres) are installed with on-board devices for GPS-positioning and radio connections. The idea is to spread the system to all tram depots.

In this respect, there is urgent need for implementation of an automated system for monitoring, dispatching and total control of the whole MPUT network. Establishment of such a centre with the required computer equipment and software built on a platform of trunk-radio systems (along the principle of cellular phones), which works with geo-stationary satellites and monitors transport in real time, would ensure extremely flexible dispatching, immediate information, a decrease in the risk of traffic jams, fewer schedule violations, better fuel economy, realisation of substantial economies of funds, etc. These types of systems with a GPS-connection have a relatively high value as an investment amounting to about USD 10 million, but the pay-off period is, typically, extremely short at up to three years.

# Tallinn, Estonia

## City territory and overview

The total area of the Tallinn's administrative region is 158 square kilometres, which is divided into eight districts (see Table 1).

At the beginning of 2001 the city of Tallinn owned 8.6 square kilometres (5.4 percent) of the total area as municipal land. Some 32.9 square kilometres (20.8 percent) of the territory of Tallinn has been privatised, and 4.3 square kilometres are owned by the state. The rest of the land also belongs to the state, as it has not been formalised in the cadastre.

In December 1997 the United Nations Educational, Scientific and Cultural Organisation (UNESCO) placed the Old Town of Tallinn on the World Heritage List. The Old Town covers only 0.7 percent of the present city territory and is inhabited by approximately 4,000 residents. Table 2 shows a breakdown of how land was used in the year 2000.

### Responsibilities of the Public Transport and Environment Department

The Public Transport and Environment Department of is responsible for:

- development, planning and supervision of the social and economic measures in the city;
- planning and introduction of common strategies environmental development, urban development, land use and transportation;
- carrying out studies and planning in the social, environmental and transportation sectors;
- cooperation with international, national and private bodies;
- supervising, monitoring and auditing the environmental, planning, urban development, construction and transport situations in Tallinn;
- management in all phases of planning activities;
- traffic and public transport management (including parking, traffic management, infrastructure planning, road safety management);
- assessment and auditing of planning solutions, supervision of planned constructions etc.;
- management of surveying and mapping activities for the city; and
- name and address management.

The main responsibilities of the department concerning public transport management are:

- network- and service-level planning;
- collecting and processing information;
- contracting services from transport companies;
- financing the system (fares, tariffs and subsidies);
- monitoring service quality;
- paying according to the quantity and quality of the service performed;
- providing information to passengers; and
- ticket vending and inspection.

The department's main traffic responsibilities include:

- urban traffic management;
- parking management (including paid parking) ;
- management of road works and temporary traffic solutions; and
- planning Tallinn's road network and traffic management.

The main responsibilities of the Tallinn Traffic Management Centre are:

- traffic management and control;

**TABLE 1**

| Name of district | Area (square km) | Percent of total area |
|---|---|---|
| Haabersti | 18.6 | 11.8% |
| Kesklinn (Centre) | 28.0 | 17.7% |
| Kristiine | 9.4 | 5.9% |
| Lasnamae | 30.0 | 19.0% |
| Mustamae | 8.0 | 5.1% |
| Nomme | 28.0 | 17.7% |
| Pirita | 18.7 | 11.8% |
| Pohja-Tallinn (Northern Tallinn) | 17.3 | 11.0% |

**TABLE 2**

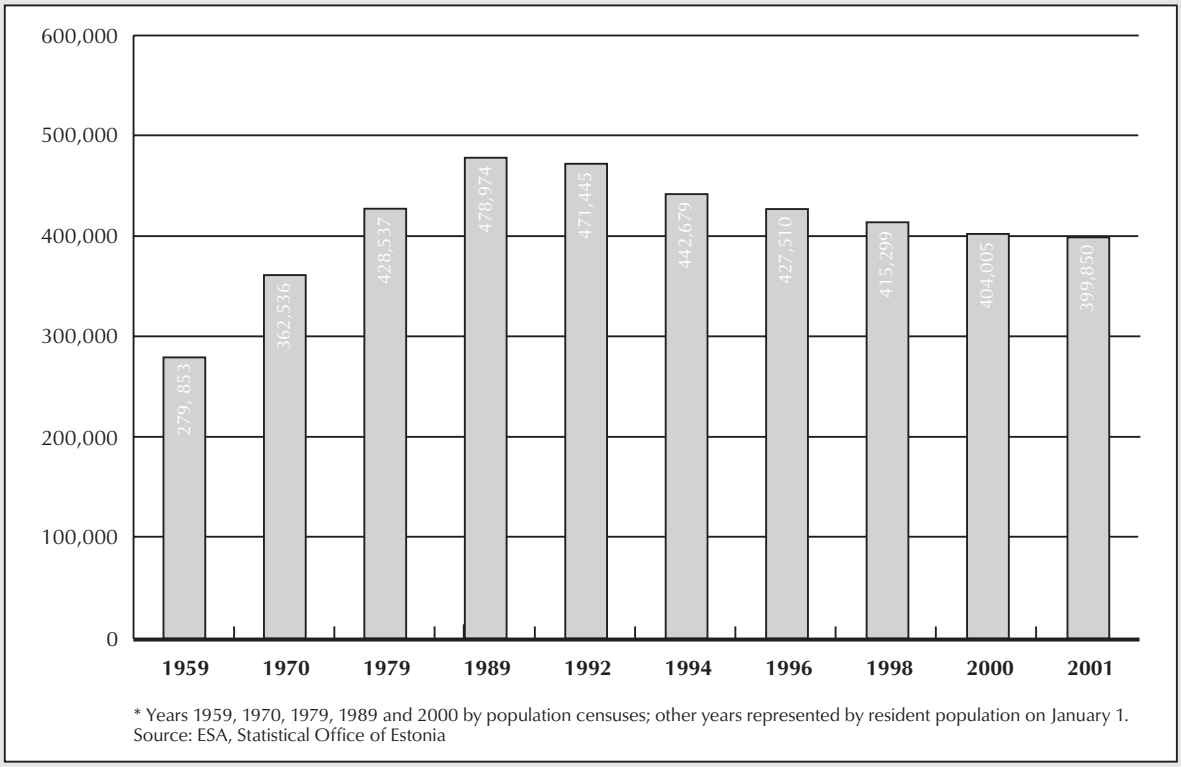
## Land use by area, 2000 (hectares)

| Purpose | Area |
|---|---|
| Blocks of flats | 333.4 |
| Single-family residence | 2,172.5 |
| Land returned to previous owners | 836.4 |
| Production buildings | 1,225.9 |
| Commercial land | 723.0 |
| Public buildings | 736.6 |
| Common uses | 1,380.4 |
| Other | |
| - Military | 64.4 |
| - Purpose not defined | 64.3 |
| - Production buildings for agriculture | |
| - Transport | 248.1 |
| - Waste dumps | 126.6 |
| - Nature preserves | |
| **Total** | **7,911.5** |
| | |
| Forests, green areas | 4,006 |
| Streets, roads | 1,321 |
| Cemeteries | 300 |
| Bodies of water | 1,206 |
| **Total** | **6,833** |

Source: Sustainable Development and Planning Department of Tallinn, 2000

**FIGURE 1**

**Dynamics of Tallinn's resident population, 1959-2001***




* Years 1959, 1970, 1979, 1989 and 2000 by population censuses; other years represented by resident population on January 1.
Source: ESA, Statistical Office of Estonia

- management of traffic signs, signals, information systems, etc. in Tallinn;
- supervision of parking and taxi services; and
- Tallinn public transport tickets (printing, selling and overall management).

## Public transport operators and networks

There are three operators serving the Tallinn public transport network today, which uses only a common (flat) fare system.

Tallinna Autobussikoondise AS (Tallinn Bus Company Limited) is 100-percent owned by the city of Tallinn. The company has 337 buses serving 48 lines. The number of employees is 1,156, the number of passengers is 67.9 million, and the total annual turnover is EEK 240.7 million (EUR 15.4 million).

Tallinna Trammi- ja Trollibussikoondise AS (Tallinn Tram and Trolley Company Limited) is 100-percent owned by the city of Tallinn. The company owns 226 vehicles (trams and trolleybuses) operating on 13 lines (five tram lines and eight trolleybus lines). The total number of employees is 1,121, the number of passengers carried annually is 67.2 million and the total annual turnover is EEK 181.7 million (EUR 11.6 million).

MRP Liinide AS (MRP Liinid Limited) is a 100-percent privately-owned operator with 29 buses. The number of employees is 70, the number of passengers is five million per year and annual turnover is EEK 15 million (EUR 1 million).

Tallinn's common-fare system network has been in place since 1990. The network features 66 lines, including 10 express (or non-stop) bus lines, eight trolleybus lines and five tram lines. Presently, the biggest problems are connections and service coordination between Tallinn and counties outside of the city, such as Harju County, with its commuter train network serviced by Elektriraudtes AS Services. This is especially important, as a number of citizens are looking for new residences outside the city, in Harju County, and thus commuting daily.

**TABLE 3**

## Number of motorised vehicles in Tallinn and Estonia, 1991-2001

| Motor vehicles | Jan. 1, 1991 | Jan. 1, 1998 | Jan. 1, 1999 | Jan. 1, 2000 | Jan. 1, 2001 |
|---|---|---|---|---|---|
| Passenger cars (Estonia) | 240,912 | 427,678 | 450,954 | 458,700 | 463,830 |
| (Tallinn) | 78,077 | 154,604 | 159,429 | 158,650 | 159,366 |
| Buses (Estonia) | 7,943 | 6,457 | 6,306 | 6,196 | 6,059 |
| (Tallinn) | 2,120 | 1,860 | 1,787 | 1,760 | 1,739 |
| Lorries and special vehicles | 67,688 | 76,605 | 80,617 | 81,030 | 82,119 |
| (Tallinn) | 13,086 | 21,196 | 22,911 | 23,343 | 23,222 |
| Motorcycles | 105,728 | 5,337 | 6,118 | 6,699 | 6,703 |
| (Tallinn) | 7,550 | 894 | 1,054 | 1,208 | 1,230 |
| **Number of passenger cars per 1,000 inhabitants** | | | | | |
| Estonia | 153 | 294 | 312 | 319 | 339 |
| Tallinn | 164 | 372 | 387 | 388 | 398 |
| **Total number of motor vehicles per 1,000 inhabitants** | | | | | |
| Estonia | 202 | 355 | 376 | 384 | 404 |
| Tallinn | 196 | 430 | 450 | 453 | 461 |

Source: Statistical Office of Estonia, Estonian Motor Vehicle Registration Centre, Motorisation Development

**FIGURE 2**

## Motor vehicle fleet in Tallinn, 1990-2001

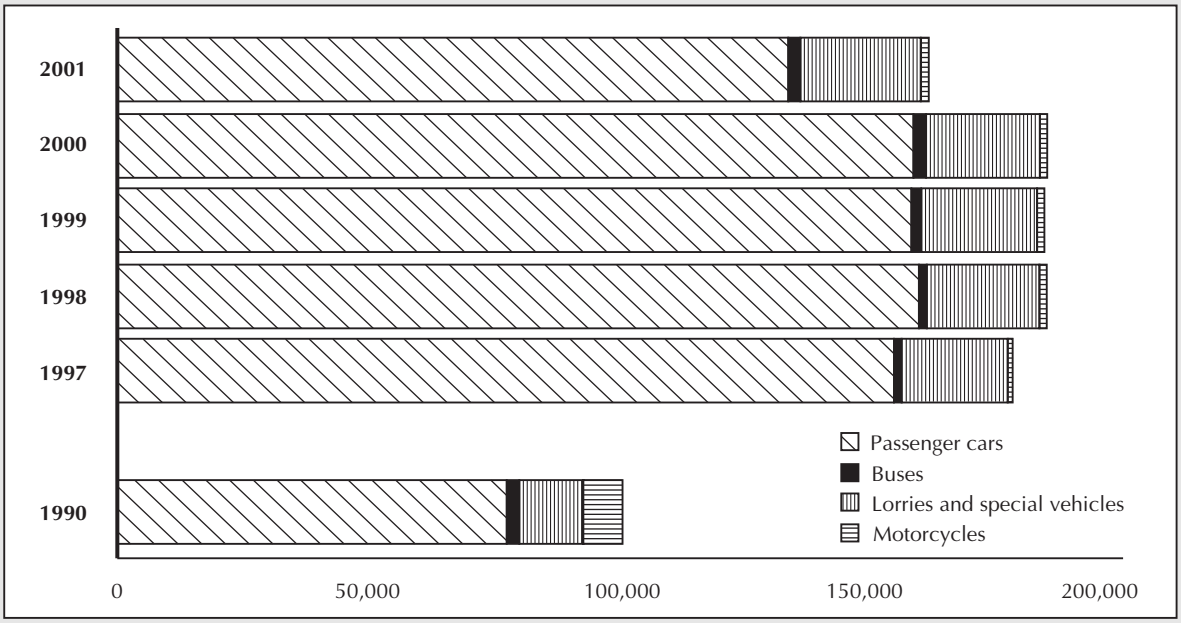
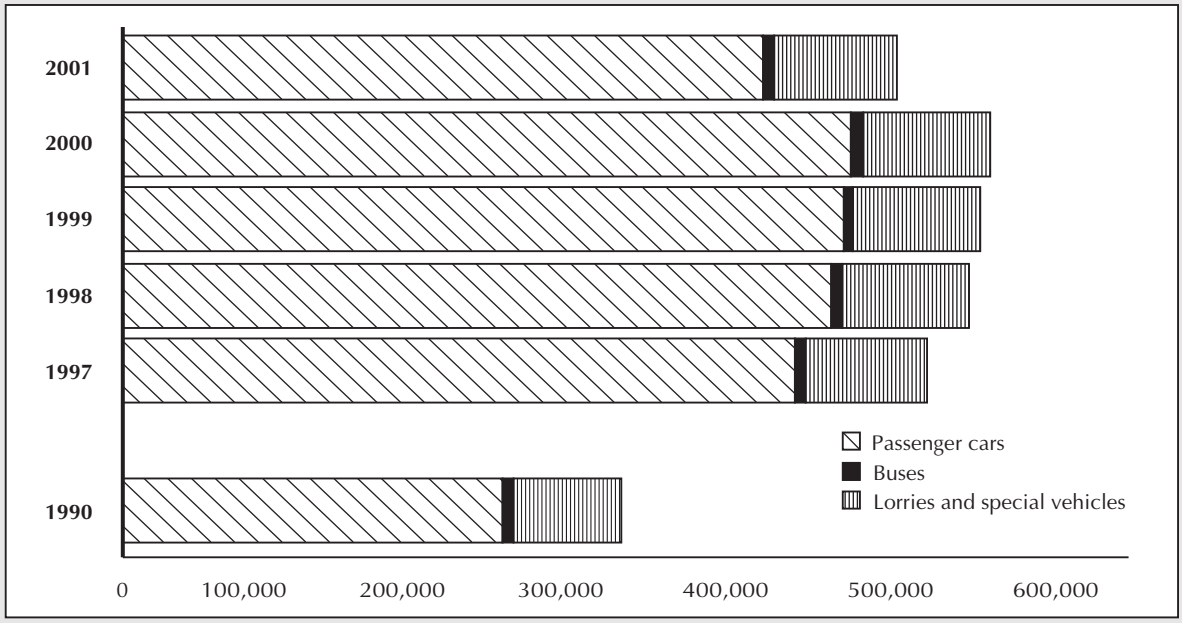


**FIGURE 3**

### Motor vehicle fleet in Estonia, 1990-2001




Source: Estonian Motor Vehicle Registration Centre

Note: The 2001 decrease in the motor vehicle fleet is the result of a new registration policy. Since 2001 only motor vehicles receiving a technical inspection, which allows them to be operated, are included in the register.

Some new projects, such as a tender on city bus services and the introduction of an electronic fare collection system, have been stopped for various reasons — mainly because of financial problems.

## The flat fare ticket system

### Line Network, Tallinn

The exchange rate for the Estonian kroon (EEK), as of July 1, 2001, was EUR 1 = EEK 15.65.

With a one-hour ticket the passenger is allowed to board any public transport vehicle (of the common public transport network) within one hour of the first boarding. When boarding an express bus the passenger must buy an additional ticket.

Discounts are available only for residents of Tallinn or as stated by law.

Free use of public transport is provided for:

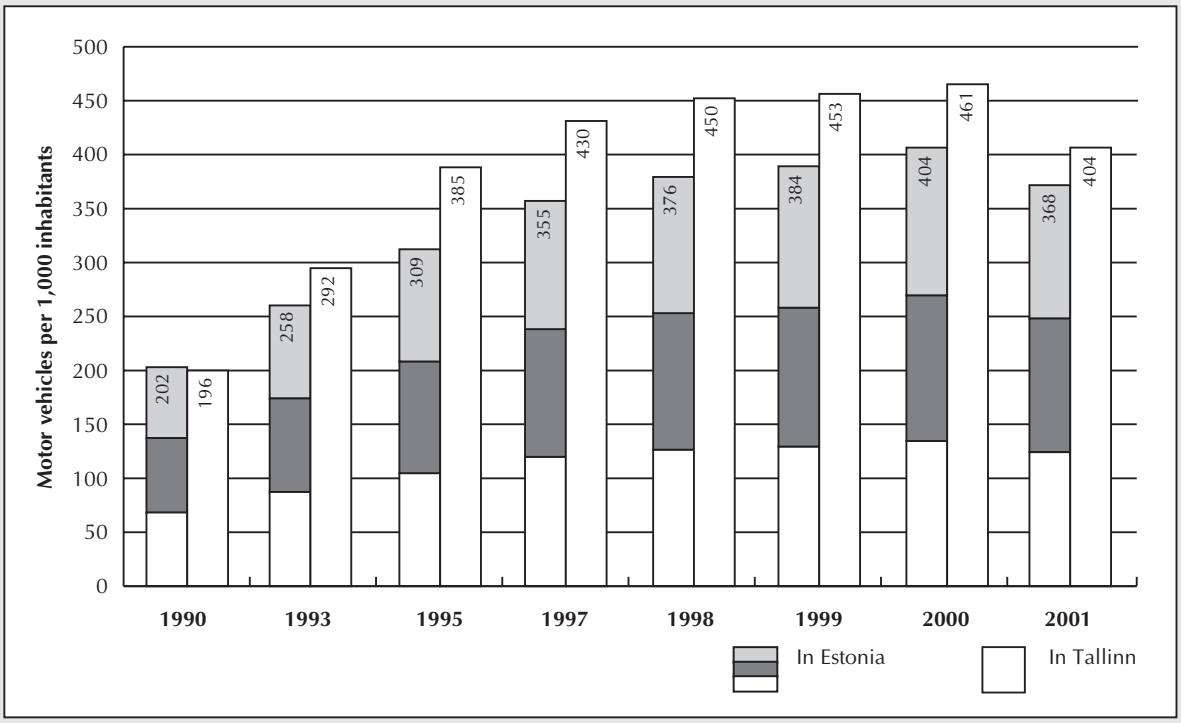
- children of pre-school age (documentation not required);
- disabled children and their companions;
- seriously disabled persons and their companions;
- veterans of the Liberty War;
- passengers 65 years old and over;
- orphans and children missing parents (with school approval);
- children from families with three or more children; and
- police officers in uniform.

Discount tickets are available for:

- pupils of secondary and primary schools under the age of 22;
- students under the age of 35;
- persons accompanying veterans of World War II;
- pensioners;
- persons (age 16 and over) with a serious or medium disability; and
- parents of three or more children.

**FIGURE 4**

**Motorisation development in Estonia and Tallinn**




Many types of tickets are sold at various points of sale under various conditions:

- Single tickets are sold aboard vehicles at newspaper kiosks.
- Hourly tickets are sold aboard vehicles.
- 30-day and 90-days tickets are sold only at kiosks.
- A passenger buying a single – or one-hour ticket should board at the front door of the vehicle.
- The driver is obliged to pass a ticket to the passenger when receiving the fare.
- The passenger should keep the ticket during the trip.

The passenger is obliged to pay the fare, punch the prepaid ticket or show the document of free travel to the driver immediately after boarding.

### Ticket control

Tickets are controlled by special inspectors and officials. The fine for unpaid travel is up to 10 fee units (EEK 600).

## Public transport objectives

In recent years, the city of Tallinn has initiated a process to strengthen integrated planning for the development of both private and public transport to improve the quality of city life and to guarantee conditions of mobility for all citizens and quarters of the city.

### Background

The city of Tallinn has developed rapidly since independence 10 years ago. The public transport system has not developed sufficiently to compete with cars, which are now the dominant mode of transport. Tallinn needs both a general transport policy and a specific public transport strategy to guide the development of a long-term sustainable and affordable transport system to meet the future needs of Tallinn's population.

### Trends and challenges for public transport in Tallinn

The role of public transport in Tallinn changed drastically from 1990 to 2000:

**TABLE 4**

## Public transport modal split in Tallinn (flat-fare system)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|
| **Bus traffic** | | | | | | | | | |
| Number of lines[1] | 55 | 51 | 48 | 48 | 48 | 50 | 51 | 52 | 53 |
| Length of lines[1], kilometres (km) | 587 | 516 | 489 | 489 | 489 | 522 | 535 | 555 | 565 |
| Fleet peak-scheduled vehicles in traffic[1] | 266 | 254 | 237 | 239 | 246 | 268 | 280 | 285 | 302 |
| Vehicles (km, thousands) | 20,575.1 | 17,929.6 | 16,629.5 | 16,937.4 | 17,231.8 | 17,847.4 | 19,179.4 | 19,100.9 | 19,561.8 |
| Place (km, millions) | 3,042.4 | 2,683.2 | 2,452.4 | 2,456.0 | 2,473.9 | 2,476.9 | 2,606.9 | 2,648.6 | 2,713.4 |
| Number of trips (millions) | 126.2 | 95.7 | 87.1 | 81.9 | 77.4 | 73.0 | 70.1 | 87.0 | 72.9 |
| **Tram traffic** | | | | | | | | | |
| Number of lines[1] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 |
| Length of lines[1] (km) | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 42 | 42 |
| Trains in traffic[1] | 68 | 68 | 67 | 67 | 67 | 67 | 68 | 74 | 75 |
| Vehicles (km, thousands) | 4,007.1 | 3,677.9 | 3,566.7 | 3,617.9 | 3,643.6 | 3,620.6 | 3,586.6 | 3,737.6 | 3,921.3 |
| Place (km, mill) | 765.9 | 689.4 | 667.2 | 672.4 | 671.6 | 665.5 | 654.3 | 678.4 | 709.4 |
| Number of boardings, (mill) | 55.6 | 42.0 | 35.2 | 35.6 | 33.6 | 30.6 | 29.3 | 34.9 | 29.2 |
| **Trolley traffic** | | | | | | | | | |
| Number of lines[1] | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 8 |
| Length of lines[1] (km) | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 68 | 68 |
| Vehicles in traffic[1] | 108 | 105 | 101 | 103 | 103 | 103 | 103 | 97 | 97 |
| Vehicles (km, thousands) | 7,550.2 | 6,808.6 | 6,667.0 | 6,659.7 | 6,700.7 | 6,750.3 | 6,818.5 | 6,658.1 | 6,626.2 |
| Place (km, mill) | 882.3 | 791.2 | 767.3 | 774.1 | 774.8 | 779.7 | 788.6 | 787.8 | 794.5 |
| Number of boardings (millions) | 49.8 | 37.6 | 31.5 | 31.8 | 42.1 | 38.9 | 37.4 | 45.1 | 38.0 |
| **Public transport total** | | | | | | | | | |
| Number of lines[1] | 68 | 64 | 61 | 61 | 61 | 63 | 64 | 65 | 66 |
| Length of lines[1] (km) | 696 | 625 | 598 | 598 | 598 | 631 | 644 | 664 | 674 |
| Vehicles in traffic[1] | 442 | 427 | 405 | 409 | 416 | 438 | 451 | 456 | 474 |
| Vehicles (km, thousands) | 32,132.4 | 28,416.1 | 26,863.2 | 27,215.0 | 27,576.1 | 28,218.3 | 29,584.5 | 29,496.6 | 30,109.3 |
| Place (km, mill) | 4,690.6 | 4,163.8 | 3,886.9 | 3,902.5 | 3,920.3 | 3,922.1 | 4,049.8 | 4,114.8 | 4,217.3 |
| Number of boardings, (mill)[2] | 231.6 | 175.3 | 153.8 | 149.3 | 153.1 | 142.5 | 136.8 | 167.0 | 140.1 |
| **Car traffic total** | | | | | | | | | |
| Number of boardings, (mill)[3] | 117.0 | 132.0 | 165.0 | 174.0 | 180.0 | 185.0 | 190.0 | 209.9 | 222.7 |

1 Year-end total
2 Calibrated value for the total of year 2000. Because of a sharp increase in ticket prices, this value is not comparable with other years.
3 Estimated value by the city of Tallinn

- The number of public transport trips has declined significantly for all public transport modes, and by almost 60 percent overall.
- The public transport market share has decreased from 77 percent to 31 percent.
- The number of car trips has increased almost three-fold.

In other words, the number of public transport users has decreased and the public transport share of motorised transport has decreased. At the same time, the expenses for public transport and ticket prices have increased.

The pressure on the entire city transport system, and especially on the city centre from much more car traffic, will require traffic management measures and integrated planning for public transport and car traffic.

Increasing car use in Tallinn will contribute to air pollution, noise problems and congestion in the coming years, and thereby reduce the quality of life for city inhabitants and make the city less appealing to visitors. Key issues include:

- The basic structure of the public transport system has remained almost unchanged for the last 10 years.
- The lack of sufficient investment in public transport has resulted in an outdated rolling stock fleet and fewer funds for public transport infrastructure.
- The current public transport system does not offer an attractive alternative for the many new car owners.
- Fares are not adjusted on a regular basis, and no long-term fare policy exists.
- The high load factor of vehicles causes low service levels.
- Without significant and visible changes in present policy, the negative trend of public transport system development will continue, and eventually transform the public transport system into a marginalised service for low-income groups only.

From 2001, municipal transport operators are entirely responsible for all investments in public transport. The investments have to be covered by the price per line-kilometre paid by the city for operations, but no significant change in the price level has been agreed to until now.

The Public Transport Act allows for investment grants from the state. As opposed to other Estonian local governments in recent years (from 1997 up to now), the city of Tallinn has received no public transport subsidies from the state due to the relatively high average income in the area.

The city of Tallinn is now faced with several strategic questions:

- What kind of city do we want?
- What kind of public transport system is best for the city?
- How do we finance new developments?

Tallinn has changed into a "car" city over a relatively short period of time. If the present situation continues without a significant modal policy in favour of public transport — including traffic management measures — assessments suggest that the public transport market share in 2010 will be between 24 and 29 percent (depending on overall economic

**TABLE 5**

## Public transport expenditure and recovery of expenses in Tallinn (EEK millions )

| **Expenses** | **1996** | **1997** | **1998** | **1999** | **2000** |
|---|---|---|---|---|---|
| Bus traffic | 153.3 | 173.2 | 202.5 | 229.0 | 251.6 |
| Trolley traffic | 74.4 | 84.6 | 93.6 | 102.3 | 99.1 |
| Tram traffic | 57.6 | 63.5 | 80.0 | 79.9 | 77.2 |
| **Total of principal activities** | **285.3** | **321.3** | **376.1** | **411.2** | **427.9** |
| | | | | | |
| **Recovery of expenses** | | | | | |
| Revenue from tickets (excluding VAT) | 126.2 | 133.7 | 170.3 | 166.2 | 172.4 |
| Subsidies | 141.4 | 172.1 | 186.9 | 216.7 | 232.8 |
| - Municipal | 113.4 | 172.1 | 186.9 | 214.7 | 230.8 |
| - State | 28.0 | - | - | - | - |
| Other revenues | 17.7 | 15.5 | 18.9 | 28.5 | 22.7 |
| Recovery of expenses (without independent revenue) | 285.3 | 321.3 | 376.1 | 411.4 | 427.9 |

*Year-end figures. Data provided by the Sustainable Development and Planning Department

**TABLE 6**

## Public transport split in Tallinn (flat-fare system)

| **Public transport** | **1993** | **1996**** | **1997** | **1998** | **1999** | **2000** |
|---|---|---|---|---|---|---|
| Number of lines* | 68 | 61 | 61 | 63 | 64 | 67 |
| Length of lines* (kilometres) | 696 | 598 | 598 | 631 | 648 | 665 |
| Vehicles in traffic* | 442 | 409 | 416 | 438 | 451 | 456 |
| Vehicle, km (thousands) | 32,132.4 | 27,215.0 | 27,576.1 | 28,218.3 | 29,584.5 | 29,496.6 |
| Place, kilometres (millions) | 4,690.6 | 3,902.5 | 3,920.3 | 3,922.1 | 4,049.8 | 4,114.8 |
| Number of trips (millions) | 231.6 | 149.3 | 153.1 | 142.5 | 136.8 | 167.0 |
| | **1993** | | **1997** | **1998** | **1999** | **2000** |
| **Bus traffic** | | | | | | |
| Number of lines* | 55 | - | 48 | 50 | 51 | 54 |
| Length of lines (kilometres)* | 587 | - | 489 | 522 | 542 | 555 |
| Vehicles in traffic* | 266 | - | 246 | 268 | 280 | 285 |
| Vehicles, km (thousands) | 20,575.1 | - | 17,231.8 | 17,847.4 | 19,179.4 | 19,100.9 |
| Place, kilometres (millions) | 3,042.4 | - | 2,473.9 | 2,476.9 | 2,606.9 | 2,648.6 |
| Number of trips (millions) | 126.2 | - | 77.4 | 73.0 | 70.1 | 87.0 |
| **Tram traffic** | | | | | | |
| Number of lines* | 4 | - | 4 | 4 | 4 | 5 |
| Length of lines (kilometres)* | 33 | - | 33 | 33 | 33 | 42 |
| Trains in traffic* | 68 | - | 67 | 67 | 68 | 74 |
| Vehicles km (thousands) | 4,007.1 | - | 3,643.6 | 3,620.6 | 3,586.6 | 3,737.6 |
| Place, kilometres (millions) | 765.9 | - | 671.6 | 665.5 | 654.3 | 678.4 |
| Number of trips (millions) | 55.6 | - | 33.6 | 30.6 | 29.3 | 34.9 |
| **Trolley traffic** | | | | | | |
| Number of lines* | 9 | - | 9 | 9 | 9 | 8 |
| Length of lines (kilometres)* | 76 | - | 76 | 76 | 76 | 68 |
| Vehicles in traffic* | 108 | - | 103 | 103 | 103 | 97 |
| Vehicles, km (thousands) | 7,550.2 | - | 6,700.7 | 6,750.3 | 6,818.5 | 6,658.1 |
| Place, kilometres (millions) | 882.3 | - | 774.8 | 779.7 | 788.6 | 787.8 |
| Number of trips (millions) | 49.8 | - | 42.1 | 38.9 | 37.4 | 45.1 |

Source: Sustainable Development and Planning Department

* Year-end total **Only total figures are available for 1996

growth), and that the number of public transport trips may decrease by 10 percent compared with 2000.

The evaluation of a vehicle replacement plan to accommodate the present public transport passenger volumes within an investment window of EEK 32 million per year shows that the average vehicle age of the three city public transport modes will rise from the 2001 level by 40-50 percent.

If the current trend continues, the average age of vehicles in 2010 will be:

- trams — 26.6 years;
- trolleys — 20.8 years;
- buses — 20.2 years.

Several problems will result from this situation:

- A significant rise in maintenance and fuel/oil costs will ensure that an operational vehicle fleet is required.
- Up to 10 percent of the present annual passenger volume will gradually be lost over the period due to decreasing riding comfort, speed and service reliability.
- Ticket revenues will decrease correspondingly (about 10 percent), requiring additional subsidies if maintenance of the present service level is desired. However, the decline in passenger numbers will allow a reduction in line-kilometres while maintaining the present average load factors, thus balancing decreasing ticket revenues. Efforts to increase ticket revenues should focus on reducing the number of non-paying passengers (legal and illegal).

**TABLE 7**

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|
| **Bus** | 126,201 | 95,668 | 87,052 | 81,886 | 77,413 | 72,973 | 70,120 | 87,017 | 72,936 |
| TAK | 126,201 | 95,668 | 87,052 | 81,381 | 77,318 | 72,936 | 70,076 | 87,006 | 68,274 |
| MRP | 0 | 0 | 0 | 505 | 95 | 37 | 44 | 11 | 4,662 |
| **Tram** | 55,575 | 41,987 | 35,199 | 35,582 | 33,558 | 30,611 | 29,293 | 34,884 | 29,214 |
| **Trolleybus** | 49,786 | 37,614 | 31,533 | 31,880 | 42,101 | 38,893 | 37,398 | 45,093 | 37,969 |
| TTTK, total | 105,360 | 79,601 | 66,732 | 67,462 | 75,659 | 69,504 | 66,691 | 79,977 | 67,182 |
| **TOTAL** | **231,561** | **175,269** | **153,784** | **149,348** | **153,072** | **142,477** | **136,811** | **166,994** | **140,118** |

Note: The methodology for calculating trips was changed in 1997.

**TABLE 8**

## Elektriraudtes AS Services: finance and operation dates

| Data | Unit | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 (estimated) | 2002 |
|---|---|---|---|---|---|---|---|---|
| Operational costs | EEK thousands | - | - | - | 62,467.0 | 69,739.2 | 65,391.7 | 72,539.0 |
| Investments | EEK thousands | - | - | - | 12,004.0 | 22,797.5 | 15,334.5 | 43,903.0 |
| Subsidies | EEK thousands | - | - | - | 56,500.0 | 73,391.5 | 62,000.0 | 58,500.0 |
| Fare income | EEK thousands | - | - | - | 18,321.6 | 21,278.4 | 22,531.1 | 24,600.0 |
| Vehicles, total | Wagons | - | - | - | 80 | 72 | 69 | 65 |
| Vehicles operating | Wagons | - | - | - | 59 | 59 | 59 | 55 |
| Trains | Number | - | - | - | 11 | 13 | 13 | 13 |
| Distances travelled | Thous. km/wagon | - | - | - | - | - | - | - |
| | Thous. km/train | - | - | - | - | 1,196.4 | 1,202.7 | 1,292.0 |
| Operations | Thous. km/wagon | - | - | - | - | - | - | - |
| | Thous. km/train | - | - | - | 1,170.0 | 1,180.0 | 1,202.7 | 1,292.4 |
| Line work | | - | - | - | N/A | N/A | 737,057.4 | 796,000.0 |
| Passengers | Thousand persons | 2,200.0 | 2,500.0 | 3,400.0 | 3,430.0 | 3,560.0 | 3,557.0 | 3,770.0 |
| Thousands passenger-km | | - | - | - | 72,300.0 | 75,100.0 | 75,252.2 | 79,000.0 |
| Train drivers | Persons | - | - | - | - | 68 | 68 | 68 68 |

Note: One train consists of two to eight wagons, mostly of four wagons. The average number of wagons is 4.5.

If the present tendencies persist and no drastic counter-measures are enacted (the "do-nothing" alternative) in the Tallinn city transport sector in general, the following could happen:

- decreasing public transport usage and mode sharing (from 31 percent to 24-29 percent);
- increasing car ownership and car use;
- increasing street congestion and time delays for both cars and public transport, affecting both passengers and operational costs; and
- increasing traffic-related accidents, noise, air pollution and energy consumption levels.

Pressure on the streets will increase and the parking problem will also be much more pronounced. The speed of public transport and all other traffic will decrease, and travel time losses will increase significantly.

Land use in Tallinn is changing. New living areas are being constructed around the city, and serving these areas with public transport may become impossible without new investments. As the number of passengers in public transport falls, additional funding will be needed to compensate for reduced ticket revenues. This means that the investments made are not used effectively to ensure vital mobility in the city for both public transport and car users, and that the total transport system will be more expensive and of a lower quality. Due to the decreased mobility in the city (both public transport and car transport) such a policy will have repercussions for city life in general.

Basically, the lack of investment and funding for public transport running costs will eventually produce rising additional demand for major road investments to avoid a local or total breakdown of the city transport system.

This would be a serious threat to continuing economic growth in general and, in particular, to successful implementation of the Tallinn Land Use Master Plan.

## The Tallinn Strategy

The city of Tallinn has proposed a mixed strategy based on analyses of different strategic options (ambitious, moderate). The strategy and investment plan for the period 2002-2010 should remain focused on improving the cost effectiveness and quality of the basic existing public transport system — not on expanding the transport system. Expensive, low-impact investment in new public transport infrastructure should be avoided.

The strategy includes clear measures to improve the attractiveness of public transport and to discourage private vehicles from entering the city. See Table 10 for details of the strategy.

The city has been chosen to direct all available investment funds to vehicle procurement, as this is the only way to address the major problems in maintaining an operational fleet of the size necessary to keep the present level of services in terms of scheduling frequency and load factors.

**TABLE 9**

### Elektriraudtes AS Services ticketing system

| Ticket type | Ticket fare (EEK) | |
|---|---|---|
| **Single ticket** | **Prepaid** | **Purchased in vehicle** |
| Normal | 10 | 15 |
| Express buses | 15 | 20 |
| Discount or additional ticket | 5 | 5 |
| 10-ticket pack | 70 | - |
| One-hour ticket, normal | - | 15 |
| One-hour ticket for express bus | - | 20 |
| One-hour discount ticket | - | 5 |
| One-hour additional ticket | - | 5 |
| **Period tickets** | - | - |
| 90-day ticket, normal | 460 | - |
| 90-day ticket for express buses | 620 | - |
| 30-day ticket, normal | 190 | - |
| 30-day ticket for express buses | 250 | - |
| 30-day discount ticket | 70 | - |
| 30-day ticket for express buses (students only) | 140 | - |

The preliminary vehicle procurement plans of the strategy target the following reductions in average vehicle age from 2002 to 2010 (for the active fleet):

- trams: from 20.2 to 18.0 years (-5 percent);
- trolleys: from 14.5 to 12.0 years (-12 percent); and
- buses: from 13.8 to 10.0 years (-26 percent).

The strategy for 2002 to 2010 is as follows:

- Invest in both local and area-wide traffic management schemes as soon as possible (EEK 85 million).
- Invest in new and modernised rolling stock to the extent affordable, preferably around EEK 1,900 million over the next eight years, and reduce the vehicle age for all modes (a minimum investment level of around EEK 1,300 million is required just to maintain present conditions for all three modes).

**TABLE 10**

## Strategy characteristics

| Package and option subjects | Option key words |
|---|---|
| **I/1:** Future public transport network | Trolley and bus network adjustments |
| **I/2:** Future role of city system modes (trams, trolleys, city buses, taxi buses) | All modes retained, average vehicle age moderately reduced (trams to 18 years, trolleys to 12 years, buses to 10 years) |
| **I/3:** Traffic management, local (public transport network) | Extensive measures (10 kilometres of public transport pre-emption) |
| **II/4:** Tallinn/Harju County/Elektriraudtes (ELR) public transport system relations | Integrated planning and ticketing (no dual-mode physical integration) |
| **II/5:** Future of TAK (city bus company) services | Unified city-owned TAK maintained tendering of all bus |
| **II/6:** Future of TTTK tram and trolley company (power supply maintained under TTTK) | Tram track infrastructure to city-owned company,<br>tendering of tram operations,<br>tendering of trolley operations (possibility),<br>unified TTTK maintained (without track responsibility) |
| **III/7:** Ticketing and payment system | Partly electronic, partly conventional |
| **III/8:** Traffic management, city-wide/area-wide | Strict measures on car parking and access (parking fare increase, new parking fare zone 3 and toll ring) |
| **III/9:** Cost economy | Improved efficiency (covered by other options) |
| **III/10:** Public transport financing (ticket revenue/subsidy) | Optimised fare structure |
| **IV/11:** Grant agreement, scope of work, point 14 | Organisation, staffing and resources required to deal with strategic planning, system regulation, safety issues, and management of service delivery |

- Elaborate financial needs for every year using the strategy investment plan.
- Be prepared to implement minor extensions of tram and trolley networks and adjust bus networks if justified by changes in passenger demand.
- Intensify efforts to improve the efficiency of transport operators.
- Maintain all three public transport modes in the system (trams, trolleys and buses).
- Electric railways should not be part of the Tallinn strategy before the financial implications are clarified and acceptable to the city.
- After a preparation period, implement a tendering system for bus services — initially in two stages, starting in 2004 and 2008, respectively (each covering 50 percent of the services). Later, on establish a continuous process by tendering of part of the services every year to improve cost efficiency in operations, but maintain TAK as a municipal company that can bid on equal terms with private operators.
- Consider tendering of all trolley operations, but not tram operations.
- Develop public service contracts between the city and the operators.
- Shift responsibility for tram track infrastructure from the Tram and Trolley Company to the city administration.
- Strengthen the city administration in terms of public transport management, (particularly for preparation and monitoring of tendering processes and public service contracts), as well as for strategic development of services.
- Base public transport ticket structure and ticket pricing on an average tariff (equals boarding price). Prices of period passes will be increased to improve revenues, and prices will generally be adjusted annually, based on the general inflation rate.
- Aim for full integration of public transport services in Harju County and Tallinn with regard to planning and fares, but do not consider tram/electric train dual mode operations

The benefits of the strategy are:

- an attractive and sustainable public transport system serving the citizens (and visitors) of Tallinn;
- an increase in public transport trips from 2002 to 2010 by around six percent;
- a more modern and cleaner vehicle fleet;
- improved ticket revenue base, due to a price increase of approximately 10 percent for period passes, and a strong effort to substantially reduce the number of non-paying passengers; and
- a more focused organisational and institutional set-up to meet requirements of the European Union.

The strategy implies a significant change in the need for funding from the city, compared to the present situation. Some of the total costs of the public transport system will be incurred by the operators (e.g. rolling stock) and others (e.g. for traffic management schemes) by different parts of the city administration. In any case, the city will have to pay for those parts of costs not covered by passengers; it is just a matter of timing and the concept chosen.

In addition to the investments in rolling stock, several other investments in the first stage of the strategy required:

- to improve the quality and service level, including increased operations (in vehicle-kilometres) to decrease the load factor of vehicles;
- various technical assistance/consultancy work to establish the basis for tendering of services and to develop further public service contracts;
- investing in a public relations campaign for public transport can be considered when new rolling stock is presented to the public; and
- investing more heavily in traffic management may also be considered early in the strategy period due to the very high benefits from these schemes.

The city of Tallinn has decided that, from 2001, all costs of public transport operators, including investments in vehicles, shall be covered via the line-kilometre tariff paid by the city to operators. This is a way of financing supported by the consultants, as it paves the way for establishing a fair and transparent tendering system in the future. However, this way of financing costs requires that the tariff per line-kilometre is increased when investments are needed or required to improve the quality of services. However, in 2002, the line-kilometre tariff was reduced by about 18 percent, which indicates that the operators will not be able to take on new investments unless the tariff per line-kilometre is increased.

Investment costs may be financed via loans taken by either the city or the operators to spread the cost over several years — for example, the lifetime of the asset. Loans may be obtained based on specific agreements between banks and the city about the future development of public transport in Tallinn.

Basically, the city of Tallinn has to decide how much it can afford and is willing to pay for improvement of the public transport system over the coming years. The gross budget for public transport constitutes 10 percent of the total city budget for 2002, which is about the same share as investments in road construction. The additional budget for public transport required by the strategy will increase its share of the city budget from 10 percent to about 14 percent over a few years.

A pragmatic, affordable public transport strategy for the city is a strategy that combines the total annual costs of the strategy with the level of ticket revenues (depending on passenger fares) and the possibility to obtain funding from the city budget. If the costs of the strategy are higher than the total funding likely available, the strategy has to be adjusted.

**TABLE 11**

## Average annual costs and revenues of investment plan, 2002-2010 (in million EEK, 2002 fixed price level)

| Key figures | 2001 | Tallinn city strategy (average per year) |
|---|---|---|
| Investments | 31 | 210 |
| Operating and maintenance | 438 | 442 |
| Net ticket revenue | 179 | 195 |
| Funding need | 290 | 458 |
| Net financial contribution from city/total public transport costs | 62% | 70% |
| Line-kilometres (millions) | 30.4 | 31.2 |

Note: Calculation of investments and funding needs is based on the assumption that investments are paid fully each year and are not financed over a number of years.

When the present subsidy percentage in Tallinn is compared with other West and East European cities, it appears to be in the middle of the range. The strategy assumes that an increase in the real price of period passes will be implemented to create a better balance between ticket types and ensure further financing for investments. The future fare for monthly passes in Tallinn compared to the purchasing power of incomes will be higher than in cities like Prague and Budapest, but lower than in Sofia.

However, the good prospects for high economic growth rates in Tallinn will soften the impact of this increase. A good principle to implement is that the institution which introduces such fares covers all costs related to concessionary fares.

The specific goal of the strategy is that the public transport share of motorised transport in Tallinn is at least 30 percent in 2010. This goal requires dedicated commitment from the city of Tallinn in terms of more financial resources to public transport. The strategy will increase the attractiveness of public transport and ensure a high probability of maintaining the present modal share for public transport, and thereby contribute to the sustainable development of Tallinn.

## Transport legislation and development plans for Tallinn, Estonia

**Legislation:**

1999 — Road Act.

2000 — Motor Vehicle Transportation Act.

2000 — Public Transport Act.

2000 — General rules on passenger and luggage transportation on buses and taxis.

2001 — Traffic Act.

**Development Plans of the Tallinn Transport System:**

1992 — Tallinn Transportation Concept, IB Stratum OU.

1998 — Development Plan on Tallinn Public Transport 1999-2001, City of Tallinn.

1998 — Development Plan of Tallinn Traffic Management 1999-2001, City of Tallinn.

2002 — Development Plan of Tallinn Road Network, Stratum OU.

2002 — Development Plan on Tallinn Parking System 2002-2005, Stratum OU.

2002 — Tallinn Public Transport Strategy and Investment Programme, COWI Consult.

**Overview of some studies and reports on the Tallinn transportation system:**

1993 — Politics of Transportation Management in Tallinn. Analysis and Proposals, Teli Mobile Systems AB.

1993 — Optimisation of the Tallinn Public Transport Network, Teli Mobile Systems AB.

1994-
1995 — Feasibility Study of the Tallinn LRT System, EU Commission Phare Programme, DHV Consultants BV.

1994-
1995 — Project on Tallinn Transportation Information System, City of Tallinn, Financed by the Finnish Ministry of Transportation and Communications.

1995-
1996 — Transportation Management Systems: a Transportation Study, Ministry of Transportation, Denmark. RH&H Consult.

1997 — Number of Passenger Trips in Tallinn Public Transport, LT-Konsultite Eesti AS.

1997-
1998 — Optimisation of Tallinn Public Transport, LT-Konsultite Eesti AS.

1999 — Study on Public Transport Vehicle Use, summer, IB Stratum OU.

1999 — Study on Public Transport Vehicle Use, winter, Inspro Konsultatsiooni OU.

1999 — Number of Passenger Trips in Tallinn Public Transport, LT-Konsultite Eesti OU.

2001 — Tram Traffic in Tallinn, Liikluskonsultant OU.

2001 — Study on Public Transport Vehicle Use, spring/winter, Inspro Konsultatsiooni OU.

2002 — Project on the Feasibility of the Introduction of Tallinn Public Transport Priority Systems, Stratum OU.

2002 — Traffic Management Systems of the Viru Public Transport Terminal in Tallinn, Stratum OU.

# Warsaw, Poland

## General data

The population of Warsaw is 1.615 million, with approximately 2.5 million inhabitants in the greater metropolitan area, depending on where the borders are drawn.

### Motorisation

- The number of registered vehicles in Warsaw (all categories) is 770,700.
- According to a recent analysis, there are 375 cars per 1,000 inhabitants. This is down from earlier statistics showing 400 cars per 1,000 inhabitants). A closer look at statistical data has led to the conclusion that the real number of vehicles in use is considerably lower than the one shown in official statistics: approximately 16 percent lower in the case of cars and 25-27 percent in case of transport vehicles and buses.
- Increase projections: in the past there were projections of continued rapid growth of motorisation up to the level of 600-650 cars per 1,000 inhabitants. Recent years have shown that the growth rate is much slower than in the first years of transition. Consequently, much slower growth is expected.

### Transport infrastructure

**Roads**

The urban road system of Warsaw has developed as a typical radial system, with most main roads going to the city centre. Fifteen national and international roads meet in Warsaw. The most important are three international roads:

- Route 2, east-west, Berlin-Poznan-Warsaw-Terespol-Moscow (E-30), A-2 motorway is planned;
- Route 7, north-south, Gdansk-Warsaw-Krakow-Bratislawa-Vienna (E-77); and
- Route 8, Helsinki-Tallinn-Riga-Kaunas-Bialystok-Warsaw-Wroclaw-Prague (E-67).

Some of these roads belong to two pan-European corridors: Number 1 is Via Baltica (Warsaw-Riga-Tallinn-Helsinki), and Number 2 is Berlin-Warsaw-Moscow.

All these roads serving international, national and regional traffic go through or are located at the edge of the city centre. Ring roads are still under development.

**Railways**

Warsaw is an important railway junction. All seven lines are electrified (at 3,000 volts). Three lines belong to pan-European (Helsinki) corridors:

- E-65 (Czech Republic), Zebrzydowice-Warsaw-Gdynia
- E-20, Berlin-Poznan-Warsaw-Terespol-Minsk-Moscow; and
- Warsaw-Bialystok-Vilnius-Riga-Tallinn-St. Petersburg.

On the most important radial line (crossing the centre in a tunnel), there are two pairs of tracks, and suburban traffic is separated from long-distance traffic. The number of trains on various lines ranges from 16 to 44 per day. Service (number of trains) has worsened in recent years. Consequently, patronage has dropped as a considerable number of passengers have shifted to buses and automobiles.

There is also one suburban line that is 32 kilometres long and serves one corridor, which runs from the Warsaw city centre to Grodzisk Mazowiecki. It is powered at 750 volts and operates special wagons. Generally, it can be classified as light rail.

**Airports**

Okecie International Airport, located seven kilometres from the city centre, served 4.7 million passengers and handled 41,023 tonnes of cargo in 2001. There were 95,877 operations in all. The airport services 72 percent of all air passengers using Polish airports. The catchment area of Okecie consists of the Warsaw and capital city regions of 2.5 million, and another 4.1 million inhabitants from neighbouring areas, including the city of Lodz with 800,000 inhabitants. Roughly 6.6 million people live within two hours' driving time of the airport.

The airport's runway capacity is close to 155,000 operations, which is equivalent to serving 12-15 million passengers. At present, airport service potential is limited by the capacity of the terminal (4 million passengers) and, to a high extent, by accessibility to the airport over land. The airport is served only by road transport (cars and buses), and access roads have a limited capacity.

There are two other general-aviation airports in the Warsaw metropolitan area — Bemowo and Goraszka. They are used by sport, sanitary, private and other small planes and helicopters.

**Physical development constraints**

Crossing the Vistula River creates a special problem because all road bridges are concentrated on one eight-kilometre stretch of the river in the city centre. The nearest other bridges are located roughly 32 kilometres to the south and 25 kilometres to the north on the Vistula River. Two railway bridges are adequate to meet present needs.

## Public transport patterns

### Authorities and their responsibilities

The roles of management and operation are separated in Warsaw. Under this arrangement, city authorities formulate fare policy, routes and schedules, programme investments, subsides and controlling services. This role is performed by a separate unit, the Municipal Transport Authority (ZTM), which is responsible for organising public transport services in Warsaw. These services are provided by bus and tram operators, as well as the underground railway, known as the metro.

### Legal and regulatory framework

In 1990 the legal framework for local transport services was redefined by two acts of Parliament concerning self-governance. According to these acts, "meeting the common needs of local communities is the responsibility of the county (municipality)." In particular, the municipality's responsibilities include communal streets, bridges, traffic management and local public transport.

Consequently, public transport companies were transferred to the municipalities and became communal enterprises.

The state has officially relinquished its role as owner and financier of urban transport (there is no ministry dealing with urban public transport), but it maintains some control over urban finances. It stipulates fare discounts for retirees, students, the disabled and some other groups of public transport users. The right to discount fares or free-of-charge trips greatly influences the size of ticket revenues.

### Transport demand and modal split

For a long time, comprehensive origin and destination surveys have been carried out at intervals varying from five to 10 years. The last two were made in 1993 and 1998.

In recent years, mobility expressed in the number of trips per inhabitant per day has not changed much. Selected data on the breakdown of transport modes is presented in tables 1 and 2.

## Transport management

In the field of public transport management, the Municipal Transport Authority in Warsaw contracts those services provided by the three most important operators owned by the municipality:

- tram company: Tramwaje Warszawskie (TW);
- bus company: Miejskie Zaklady Autobusowe (MZA); and
- underground railway: Metro Warszawskie (MW).

In addition, there are two smaller bus operators contracted by the Municipal Transport Authority:

- RAPID-BUS Ltd; and
- PPKS Grodzisk Mazowiecki.

A standard contract between the Municipal Transport Authority and the operator contains an Annex on Evaluation of Quality of Transport Operation. In this annex, special attention is paid to service reliability and punctuality. Evaluation methodology takes into account (in a systematic way) delays caused by traffic congestion.

The operator is obliged to provide services according to detailed routing and schedules defined by the Municipal Transport Authority and is paid on the basis of per-vehicle kilometres. Quality and reliability requirements and penalties for not meeting such requirements are specified in the annex per agreement in the following areas:

- unreliability index, equal to the percent of scheduled services not provided;
- punctuality index (applied to bus and tram service evaluations), equal to the percent of departures from selected stops earlier than two minutes or delayed more than three minutes according to schedule;
- regularity index (applied to underground service evaluations), which indicates the average waiting time for service at metro stations;
- technical deficiencies of vehicles, which reduce the standard of travelling and/or safety;
- whether vehicles are clean;
- whether passengers have access to transport information;
- whether drivers stop at the designated stops or open doors as required; and
- whether departures from end-stops are earlier than scheduled.

**TABLE 1**

## Modal split

| Travel mode | All trips | | Non-walking trips | |
|---|---|---|---|---|
| | **1993** | **1998** | **1993** | **1998** |
| On foot | 30.1% | 20.5% | - | - |
| Car and taxi | 20.4% | 26.5% | 29.2% | 32.9% |
| Public transport | 48.7% | 52.5% | 69.6% | 66.0% |
| Bicycle | 0.6% | 0.4% | 0.9% | 0.6% |
| Other | 0.2% | 0.4% | 0.3% | 0.5% |
| **Total** | **100%** | **100%** | **100%** | **100%** |

**TABLE 2**

## Modal split in public transport trips between the northern and southern districts of Warsaw during morning and afternoon peak hours

| Period | 7:00-8:00 | | 15:00-16:00 | |
|---|---|---|---|---|
| **North-South** | **Persons/hour** | **Percent** | **Persons/hour** | **Percent** |
| Buses | 18,875 | 55 | 18,502 | 55 |
| Trams | 11,254 | 32 | 11,245 | 33 |
| Underground | 4,450 | 13 | 4,104 | 12 |
| **Total** | **34,579** | **100** | **33,851** | **100** |
| **South-North** | | | | |
| Buses | 17,900 | 57 | 16,106 | 52 |
| Trams | 9,994 | 32 | 11,250 | 37 |
| Underground | 3,560 | 11 | 3,322 | 11 |
| **Total** | **31,454** | **100** | **30,678** | **100** |

Source: Warsaw Traffic Surveys, 1998

# Public transport network

General data about the public transport network:

- total length of bus transport network: 849.1 kilometres;
- total length of bus lines: 2,975.7 kilometres;
- total length of tram transport network: 121.8 kilometres;
- total length of tram lines: 469.8 kilometres;
- total length of underground line: 14.2 kilometres.

The bus transport network consists of:

- 87 ordinary lines with full-day service;
- 29 ordinary lines with partial-day service;
- 23 semi-express lines with full-day service;
- 16 semi-express lines with partial-day service;
- 5 express lines with partial-day service (peak hours only);
- 24 suburban lines with full-day service;
- 5 suburban lines with partial-day service; and
- 12 night-service lines.

The tram transport network consists of:

- 29 lines with full-day service; and
- 2 lines with partial-day service.

Average distances between bus stops are:

- 520 metres on ordinary lines with full-day service;
- 512 metres on ordinary lines with partial-day service;
- 797 metres on semi-express lines with full-day service;
- 776 metres on semi-express lines with partial-day service;
- 1,340 metres on express lines;
- 717 metres on suburban lines with full day service;
- 699 metres on suburban lines with partial day service; and
- 498 metres on lines with night service.

Average distances between tram stops are:

- 456 metres on lines with full-day service; and
- 511 metres on lines with partial-day service.

The average distance between underground stations is 1,092 metres. The accessibility of public transport stops in Warsaw, both in the city as a whole and in particular districts, is shown in Table 3.

As mentioned earlier, the metropolitan area is served by seven radial lines of suburban railway and one light-rail line. They mostly serve commuting passengers from suburban areas.

# Financing of public transport

## Annual budget

In the 2002 municipal budget for the city of Warsaw, total expenses for local public transport equaled PLN 1,269 million (EUR 317 million). Of this amount, PLN 824 million (EUR 206 million) was spent on current expenses, and PLN 445 million (EUR 111.25 million) on investment. Revenues from ticket sales (PLN 550 million, or EUR 137.5 million) covered 66.7 percent of current (operating) expenses.

Investment costs were covered from the following sources:

- loans: PLN 215 million (EUR 53.75 million) — 48 percent;
- state budgets: PLN 110 million (EUR 27.5 million) — 25 percent; and
- municipal budget: PLN 120 million (EUR 30.0 million) — 27 percent.

The bulk of investment money went to finance the construction of the metro line. Only PLN 83 million (EUR 20.75 million), or 19 percent, was spent on renewal of the bus and tram fleets.

## Sources of funding

Public transport operations are financed by revenue from the sales of tickets and subsidies from the municipal

**TABLE 3**

### Accessibility of public transport stops in Warsaw

| | Percentage of inhabitants living within 500 metres of a public transport stop | | | |
|---|---|---|---|---|
| | **Bus (%)** | **Tram (%)** | **Train (%)** | **Metro (%)** |
| Warsaw total | 98 | 50 | 8 | 8 |
| Warsaw centre | 99 | 62 | 13 | 9 |
| Bemowo | 97 | 69 | 0 | 0 |
| Bialoleka | 90 | 0 | 4 | 0 |
| Bielany | 99 | 65 | 0 | 0 |
| Rembertow | 82 | 0 | 18 | 0 |
| Targowek | 99 | 34 | 2 | 0 |
| Ursus | 97 | 0 | 12 | 0 |
| Ursynow | 99 | 0 | 0 | 48 |
| Wawer | 86 | 0 | 21 | 0 |
| Wilanow | 94 | 0 | 0 | 0 |
| Wlochy | 86 | 29 | 31 | 0 |

budget. Since the beginning of the transition period, the state has not financed local transport. The only exception is the Warsaw metro development project, which is partially financed from the central budget. Decisions are made every year by Parliament and are usually subjects of heated debate.

Discount fares continue to strongly influence the financial results of operators. It is estimated that if urban transport companies received financial support from municipalities to compensate discount fares and free rides, it would cause an increase in cost-recovery ratios and ensure full cost coverage for urban transport companies in most cities.

Because of insufficient funds for investment and repairs, Polish cities and companies search for different ways to gain financial resources for these purposes. Unfortunately, the legal status of municipalities and state policies make it practically impossible (with very few exceptions) for municipalities to use the funds given by international financial institutions the World Bank and the European Bank of Reconstruction and Development (EBRD), for example, which have systematically offered support for urban transport.

Changes in the occupancy (or, "loading" factors) of buses in the past 10 years are shown in Table 5. Vehicle capacity was calculated using the standard rate of 6.7 persons per square metre.

Unfortunately, state guarantees are are necessary for municipalities to use this opportunity.

## Use of economic instruments

Taxes are not directly used to regulate public transport patterns. This occurs indirectly, however, because subsidies to the Municipal Transport Authority are used to cover the difference between total operating costs of transport companies and revenues from fares and other sources. These subsidies come from the municipal budget, which is based on tax revenues. Therefore, how much money is allocated to public transport depends upon the political decisions of the municipal government. This determines the quality of services commissioned.

## Bus transport

- Size of vehicle fleet: 1,606 buses.
- Average age: eight years.
- Average operational speed: 17.77 kilometres per hour.
- Kilometres travelled: 97,129,000 kilometres per year.

### Rolling stock inventory

Warsaw possess the following makes of low-floor buses:

- IK 411 — 2 buses;
- Jelcz M121M — 109 buses;
- Jelcz M181M — 46 buses;
- MAN NG313 — 60 buses;
- Neoplan N4020 — 104 buses; and
- Solaris Urbino 15 — 153 buses.

Warsaw possesses the following makes of medium- and high-floor buses:

- IK 405 — 5 buses;
- IK 435 — 5 buses;
- IK 260 — 322 buses;
- IK 280 — 768 buses;
- Jelcz M11 — 5 buses;
- Jelcz 120 M — 70 buses;
- MAN SD202 — 1 bus;
- DAB — 3 buses; and
- other — 6 buses.

**TABLE 4**

### Renewal of Warsaw bus fleet (1996-2001)

| Year | Number of buses | | |
|---|---|---|---|
| | **Delivered (D)** | **Cancelled (C)** | **D-C** |
| 1996 | 55 | 92 | -37 |
| 1997 | 183 | 135 | 48 |
| 1998 | 95 | 159 | -64 |
| 1999 | 45 | 54 | -9 |
| 2000 | 0 | 27 | -27 |
| 2001 | 211 | 124 | 87 |
| **Total** | **589** | **591** | **-2** |

**TABLE 5**

### Vehicle loading factors in bus transport

| Loading factor | Percentage of bus lines | |
|---|---|---|
| | **1990** | **2000** |
| Up to 60% | 30.9 | 29.0 |
| 61-75% | 27.3 | 35.8 |
| 76-90% | 30.9 | 26.7 |
| Over 90% | 10.9 | 8.5 |

### Tram transport

- Size of vehicle fleet: 869
- Average age: 18.5 years
- Average operational speed: 15.01 kilometres per hour
- Kilometres travelled: 47,359,000 kilometres per year

**Rolling stock inventory**

- 105N — 584 vehicles
- 13N — 247 vehicles
- 114Na — 30 vehicles

Change in the loading factors of buses in the last 10 years are shown in Table 7. As with buses, vehicle capacity was calculated using the standard rate of 6.7 persons per square metre.

### Metro

- Size of vehicle fleet: 108 wagons

**TABLE 6**

**Renewal rate of trams (1996-2001)**

| Year | Number of trams | | |
|---|---|---|---|
| | Delivered (D) | Cancelled (C) | D-C |
| 1996 | 13 | 29 | -16 |
| 1997 | 18 | 18 | 0 |
| 1998 | 27 | 27 | 0 |
| 1999 | 26 | 31 | -5 |
| 2000 | 20 | 26 | -6 |
| 2001 | 62 | 70 | -8 |
| **Total** | **166** | **201** | **-35** |

**TABLE 7**

**Vehicle loading factors in tram and underground transport**

| Loading factor | Percentage of lines | |
|---|---|---|
| | 1990 | 2000 |
| Up to 60% | 29.0 | 17.8 |
| 61-75% | 38.7 | 26.5 |
| 76-90% | 29.0 | 50.0 |
| Over 90% | 3.3 | 5.9 |

- Average travel speed: 36 kilometres per hour
- Kilometres travelled in 2001: 10,573,000 wagon-kilometres
- Average age: five years (new wagons have been delivered gradually from the year 2000, and a total of 108 wagons will be delivered in 2004)

**Rolling stock inventory**

- Type-81 Russian-produced wagons for four-unit trains — 60
- New Metropolis (Alstom) wagons for six-unit trains — 48

The loading factor of underground trains during peak hours exceeds 90 percent. The growth rate of the number of passengers is illustrated in Table 8.

## Vision for public transport development

### National transport policy

In the first years of the transition period, the central government left all responsibilities for urban transport to local authorities. In view of emerging problems, a new approach has been adopted. A new law defined the government's responsibility for urban transport, and a new draft national transport policy (Suchorzewski, 2001) clearly shows an intention to provide some assistance and support to local governments in the urban transport sector.

The National Transport Policy for Sustainable Development for the Period 2000-2015 assumes that the present transport policy has to be re-oriented for (among others) the following reasons:

- the need to assign higher priority to sustainable development;
- the need to adjust the transport system to requirements of the European Union (EU); and
- the necessity to balance the growth of motorisation with the capacity to develop road infrastructure.

The need for extensive promotion of public transport, especially in cities and metropolitan areas, was mentioned among the four main challenges for the Polish transport system. After reviewing various policy options, a sustainable development strategy was selected as a basis for formulating detailed policy objectives and measures.

Solving emerging transport problems in cities and metropolitan areas was considered a great challenge for the decentralised state and local governments. One option is that the state will assist municipalities through participation in financing the most important capital-intensive public transport investment projects (first of all, rail systems in large urban agglomerations), providing loan guarantees for system-

project upgrades and disseminating information on and promoting best practices in urban transport, including non-mechanised means of transport (bicycles, walking).

It is also envisaged that the state (through the ministry responsible for transport) will create conditions for better coordination of local and regional development plans and programmes containing components (such as roads) belonging to different functional levels (national, regional, county, local). New legislative initiatives of the ministry will arm municipalities with measures to generate financial resources for the development, maintenance and operation of transport systems. Parking charges, tolls for using bridges and entering city centres, and congestion pricing were mentioned as examples.

Finally, the need to promote reforms in local transport management systems and the cooperation of local governments in organising metropolitan transport system was stressed.

There is no doubt that the elements of national transport policy described above would be favourable for urban public transport. However, the document has not yet been approved.

Another fact of the new approach is the latest act of Parliament on restructuring and privatising the Polish State Railway Enterprise (adopted October 12, 2000). This act, through the building of a legal framework for modern, commercially-oriented rail services, also addresses solutions for urban and regional rail services on a similar basis, as mentioned earlier.

## Local transport policies

Transport policies adopted in recent years by the authorities of several Polish cities have many points in common. All these policies are based on the principle of sustainable development. The term "sustainability" is used in its broadest sense — i.e. social, economic and environmental sustainability.

Generally, it addresses matters such as:

- integration of land use and transport planning;
- promotion of public transport;
- reducing car use in urban areas, first of all in central areas;
- traffic management;
- traffic-easing measures for central areas and residential districts;
- promotion of the use of bicycles; and
- traffic safety measures.

This does not mean that there are no intentions to improve and develop road networks and parking facilities. However, in most places it is assumed that priority should be given to the development of roads in such a way that the central- and high-density areas will not serve through-traffic.

## Warsaw

The decision to formulate a new transport policy for the city of Warsaw was taken in the early 1990s. During preparation of a draft policy document, the results and recommendations of the first European Conference of Ministers of Transport/Organisation for Economic Cooperation and Development (ECMT/OECD) project on sustainable urban travel were taken into account and used in the process of promoting the draft. Four options were studied, ranging from a "motorised city" to a "car-free city." City authorities proposed a "sustainable transport policy" option for consideration.

After long discussions and consultations, the Resolution on Transportation Policy was unanimously passed by the Warsaw City Council on November 27, 1995.

The general objective of Warsaw's transportation policy was formulated as:

> . . . the application of a strategy of sustainable development for the city through the creation of conditions conducive to the efficient and safe transportation of persons and goods, while guaranteeing priority for public transport. The development of transportation should stimulate economic development and a spatial order in the city; it should improve the city's prestige and decrease differentiation in development and the quality of life in specific areas of the urban agglomeration, while fulfilling (under existing and expected economic conditions) the requirements of restricting the negative impact of transportation on the environment.

**TABLE 8**

### Number of passengers served by the Warsaw metro

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1995** | **1996** | **1997** | **1998*** | **1999** | **2000** | **2001**** |
| Passengers (millions) | 19.9 | 27.0 | 29.5 | 36.4 | 48.8 | 57.5 | 70.0 |

*Extension of one more stop constructed

**Extension of two more stops constructed

Evaluations of how the Warsaw transport policy of 1995 was implemented have been performed on several occasions, including at an ECMT/OECD conference held in Athens in June 1998. While this evaluation was, by no means, the subjective opinion of this author, it provided a general impression of the degree to which objectives have been met and measures applied. Out of 68 points (objectives and measures) analysed, two were considered fully implemented, 40 partially implemented; nine were not implemented, but preparations for implementation were at an advanced stage. In 14 cases no action had been taken, and in four cases action could not be taken for lack of legal bases.

City authorities have designated metro construction as the highest-ranking priority. However, in spite of devoting considerable resources (including those from the central budget), the construction of the first line has not progressed much — just 15 kilometres built in 18 years. Limited progress was made in improving bus and tram transport, and the process of deterioration of suburban railway services has not been stopped. In particular, priorities for trams and buses were introduced to a very limited extent. Warsaw is among those cities for which implementation of medium- and long-term strategies is hampered by an annual budgeting system that makes the execution of larger projects difficult.

While implementation of policies and plans is slow, there are good reasons for optimism. So far, no proposals have been made to amend the policy.

In Warsaw, the objectives and general directions and measures of the transport policy of 1995 were taken as given during most of the recent planning studies and programmes, including the Study on Conditions and Directions of Spatial Development adopted by the city council in July 1998. The conclusions and recommendations of this study were fully consistent with the transport policy adopted three years earlier.

At the same time, public opinion has not changed regarding the status of public transport. The results of two travel surveys completed in 1993 and 1998 show that the majority of respondents (64 percent in 1993 and 66 percent in 1998) are in favour of priorities for buses and trams in traffic (even if it aggravates traffic conditions for private cars) — and support is growing. Even the majority of car owners (59 and 61 percent, respectively) are still ready to welcome certain measures, such as exclusive bus lanes.

The same survey disclosed that, among public transport users, there is a shift from the use of buses to tramways. This is happening at a time when new buses are being purchased, but the tramway fleet is ageing. This trend would certainly be even more visible if plans to renew the tramway fleet and upgrade the tracks and power-supply system had been implemented.

## Warsaw in comparison to other Polish cities

Krakow (750,000 inhabitants) was the first city in Poland to introduce such measures as limiting car traffic in the historic centre of the city and imposing parking charges (in 1987). A new transportation policy adopted in 1993 was coordinated with the Local Master Spatial Development Plan (approved in 1994). Both included objectives such as curbing urban sprawl, traffic zoning and easing, priority for public transport, and a parking policy. In particular, the potential of the existing tramway system was recognised. In 1996, the city council adopted medium- and long-term programmes for tramway upgrade and development — including plans to build a new, faster tram line. This project is gradually being implemented in cooperation with the EBRD. At the same time, great efforts have been made to improve the existing tram system through fleet replacement, with priority given to the most congested sections of the network and applying advanced methods of quality management through contracts with operators.

Several other cities have followed Krakow and Warsaw in adopting the strategy of sustainable development according to the following principles:

- limiting the role of the car in the city and giving priority to mass transport, pedestrians and cycle traffic, especially in city centres;
- elimination or reduction of through-traffic by building by-passes and ring roads;
- pressing on with rehabilitation and more effective utilisation and modernisation of existing infrastructure and equipment, which includes better utilisation and upgrading of the extensive tramway systems existing in many Polish cities;
- installing advanced systems of traffic management, with priority given to mass transport; and
- widening the scope for using financial instruments (the first stage includes parking fees, with road congestion pricing to be included in the future).

For public transport, with its limited financial resources, priority is now being given to investments in bus and tram fleets in almost all cities: this includes equipment and software to assist operations, maintenance and management. Some cities (Katowice, Krakow, Lodz) have started upgrading their tramway systems.

Great effort has been made to restructure operating companies with a view to improving their performance and/or reducing costs. Several cities have turned their mass transport operators into corporate organisations to be run under commercial law. At present, they are still 100-percent owned by municipalities, but managerial independence has been increased and they are seeking private partners and investors.

It is becoming common for municipalities to retain those regulatory functions (service patterns, schedules, fares) now often carried out by a specialised transport authority — thus leaving operations to company management.

Relationships between operators and municipalities are increasingly regulated through service agreements based on fixed rates for agreed vehicle-kilometres of service and stringent performance control.

There is growing awareness of the importance of quality among both authorities and operators. In cities where contracts are used, they contain quality requirements. Simple measures of quality are evolving – from punctuality to more complex methods of quality evaluation, with several criteria and advanced statistical means of quality control. Financial incentives (bonuses and penalties) for operators have been introduced. Marketing studies and stated preference surveys are becoming popular.

## Influence of European Union

As in other countries, most European Union accession-related programmes, plans and EU directives in the transport sector pay high regard to matters of international and national transport. During the whole transition period, only a small part of EU financial and advisory assistance was related to local transport matters. Obviously, following EU directives regarding transport as a whole (for instance, technical and environmental standards, commercialisation and demonopolisation) also has an impact on local transport.

In Warsaw's case, there has been some assistance with formulating transport policies and plans. Examples of projects to assist city authorities have been provided in this case study.

## Priority problems and needs

In Warsaw, as in other Polish cities with growing motorisation, the number of passengers using urban public transport is decreasing. In the process of decentralisation, more responsibility was passed to local governments, but the state still intercepts a very high proportion of taxes. As a result of national policy, cost recovery from fare revenues sharply increased to levels much higher than in EU countries. But the long-term consequences were serious. With scant financial resources, the scope for fleet renewal, infrastructure repair and modernisation, and system development was narrowed to a minimum. Capital-intensive projects have almost totally ceased, except for continuating construction of the Warsaw underground, which is co-financed by the state budget on a year-to-year basis. In fact, in recent years, this is Poland's sole example of state assistance for urban transport.

Warsaw authorities made great efforts to reduce subsidies through increasing fares and by putting pressure on operators to increase efficiency. The Municipal Transport Authority was created, and service agreements or contracts with municipal transport companies were introduced. Only in recent years were private operators contracted to provide some services, but their role remains limited.

The integration of municipal transport with suburban railways is another unsolved problem. In Poland, international and inter-city services have been emphasised in improvement programmes for railway operations. The concept of transferring the responsibility for subsidising commuter/suburban services to local governments is often promoted, for example, by international finance institutions (i.e. the World Bank, EBRD). This requires not only establishing a legal framework, but also the financial resources in municipal/county budgets. With the present difficulties in financing the operation and development of urban transport, the problem cannot be resolved without changes in the national finance system – namely in the formula for allocating national funds.

It is clear that long-term continuation of existing policies will lead to degradation of the public transport system, and to other undesired effects. The need to increase the inflow of financial resources is obvious. The list of possible steps includes:

- revising fare policy and refinancing of discounted fares;
- introducing various forms of taxation (such as taxing transport system beneficiaries); and
- introducing charges for the use of roads and city parking, with allocation of part of the revenues to public transport.

The gap between the availability of city finances and the need to maintain and modernise urban public transport leads to the conclusion that the most promising ways of using limited resources is through investment in:

- an advanced system of traffic management in urban public transport companies;
- rehabilitation of tramway infrastructure and upgrading existing tramway lines (especially those on separated tracks); and
- urban traffic management systems providing priorities for public transport vehicles.

Last, but not least, a change in state policy with regard to urban transport is urgently needed. The government has gone too far in decentralising the transport sector. In this context, perhaps it is worthy to quote one opinion and recommendation published in the 1995 World Bank report on urban transport in Poland (Warsaw City Office, 2000), where it was written:

> . . . [T]he absence of any explicit state interest or action related to mass transport is anomalous . . . It is recommended that the Ministry of Transport and Maritime Economy should be re-engaged as the functional "sponsor" of mass transport. This would not be a return to old paternalistic ways and a purse-holding role, but would follow an agenda common to ministries of transport in industrial economies.

Unfortunately, this recommendation is still valid to the extent that in the recent World Bank memorandum "Poland: Strategic Priorities for the Transport Sector" (World Bank, 1994), among 10 "strategic recommendations" the following can be found: "set up an urban transport policy and support unit in the Ministry of Transport (or in the Ministry of the Interior)."

## Measures to address problems and needs at national and local levels

### National level

According to prevailing views of experts and the World Bank, the state probably went too far in decentralising all urban public transport and handing the responsibilities to municipalities. There is a need to change this situation — for example, by adopting solutions presented in the draft national transport policy described earlier. This would be consistent with practices in European Union countries and some accession countries.

Other measures include resolving the following problems:

- financing public service obligations and redistributing taxes (including the fuel excise tax) and revenues;
- financing suburban railway services; and
- developing cooperation between local governments in the metropolitan area.

### Local level

Measures to be applied at the local level are determined by the main directions of local transport policy. To implement the sustainable transport policy adopted by the Warsaw City Council, it is essential that high priority be given to urban public transport. This can be done through increased subsidies to cover the deficit of operating costs and implementing projects listed below.

## National and municipal contribution

As mentioned earlier, state contributions for financing public transport projects in the city was and is limited to co-financing the construction of the Warsaw metro. But even in this case, this is done on a year-to-year basis, which does not allow for multi-year project planning and execution.

Metro construction is a priority public transport project and, in fact, absorbs most of the municipality's resources allocated to public transport investment. During the whole period of transition (1989-2001) other investments in public transport were limited to fleet renewal and extending the tram network by three kilometres. Only in recent years have more resources been allocated to modernising tracks and power-supply systems, but more improvements are necessary.

## Transport programmes

International support and assistance for feasibility studies, assessments, institutional strengthening, capacity building, investments and loans include programmes such as:

- Warsaw Urban Transport Review, The World Bank, 1992.
- Warsaw Public Transport Investment Programme, EBRD, W.S./Atkins, 1993.
- Feasibility Study for the North-South Urban Transport Corridor, Phare Project, W.S. Atkins, Societe Francaise Etudes Realisations Transports Urbains (SOFRETU), French Engineering Consultants (BCEOM), Warsaw Planning Development Office (BPRW), 1996.
- Urban Transport in Warsaw. Railway East-West Connections, Phare Project, WS Atkins, International Consulting Engineers for Rail and Urban Transport (SYSTRA), BCEOM, BPRW, Metroprojekt, 1997.
- Warsaw Transport Node, Phare Project, WS Atkins, BPRW, 2003.

## Financial institutions

International financial institutions (World Bank, EBRD) offered loans to Warsaw a number of times but, for two reasons, without any success. First, there is a lack of willingness from national governments to guarantee municipal debts. Second, city authorities have not necessarily been interested in investigating the viability of implementing projects considered by international financial institutions. Generally, banks have recommended concentration on maintenance, rehabilitation, and upgrading projects, as well as projects aimed at making better use of existing facilities, such as advanced traffic management systems. But policy makers have assigned highest priority to expensive, investment-heavy projects, such as the Warsaw underground.

A list of priorities does exist, but the cost of implementation is much beyond the city budget's capabilities. The list includes a number of projects that would improve the quality of public transport. In addition to the metro project (which is to be accelerated, and which is the top priority of city authorities), the following projects are on the list:

- renewing tram and bus fleets;
- upgrading selected tram lines serving the main corridors crossing the city centre (in addition to metro and suburban railways); upgrading would include: modernisation of tracks, stops and power supply, traffic priorities at intersections, advanced traffic management and real-time information for passengers via internet and mobile phone (pre-feasibility study is completed);
- building short sections of trams in peripheral zones;
- introducing tram/bus priority traffic control at intersections; this is to be incorporated into the Advanced Traffic Management System (CEZAR); a related tender is approaching its second stage;
- increasing the length of bus lanes;

- developing park-and-ride schemes; and
- establishing a railway connection between the city centre and Okecie International Airport.

## Endnotes

**1** Rate of exchange – EUR1 = PLN4

**2** Total amount allocated to metro construction.

**3** Summarised in "Urban Travel and Sustainable Development," ECMT/OECD, Paris 1995.

## References

IGKM (Chamber of Urban Transport). Urban Transport in Poland. working document prepared in the framework of the QUATTRO project. Warsaw 1997.

IGKM. Komunikacja miejska w liczbach (annual reports).

IGKM. Warsaw. 1999.

IGKM. Warsaw, 2001.

Implementing Strategies to Improve Public Transport for Sustainable Urban Travel. International workshop. Athens. June 3-4, 1999.

Suchorzewski, W. *Transportation Policy for the Capital City of Warsaw – Three Years After Adoption*. ECMT/OECD.

Suchorzewski, W. "The Funding Of Public Transport Investment in Central Europe." Paper presented at the International Union of Public Transport/European Conference of Ministers of Transport (UITP/ECMT) Seminar on Financing Urban Public Transport. Paris. October 13-14, 1999.

Suchorzewski, W. et al. *Urban Transport in Poland. 1998.*

Suchorzewski, W. et alt. (2001). *Urban Transport in Poland. 2000*.

Suchorzewski, W. "Transport Policies in the Countries of Central and Eastern Europe - Policy Framework." ECMT Transport Policy Forum. Paris. February 26-27. 2001.

Warsaw City Council. Budget for Year 2002.

Warsaw City Office. Implementation of Policies for Sustainable Development. Questionnaire on urban travel. Prepared for ECMT/OECD project on sustainable urban travel. 2000.

World Bank. *Poland: Urban Transport Review*. Report No. 12962-POL. Washington, D.C. October 28, 1994.

World Bank. *Poland: Strategic Priorities for the Transport Sector*. Report No. 19450-POL. Washington, D.C. June, 1999.

# Part 2
# Public Transport Financing — Status, Priority Problems and Needs

# Bucharest, Romania

## General Data

### Location, population

Situated in southwest Romania about 60 kilometres from the Danube River, 100 km from the Carpathians and 250 km from the Black Sea, the city of Bucharest stretches along an area of 228 $km^2$, plus another 365 $km^2$ that represent the metropolitan area. Bucharest has all the characteristics of a metropolis, including a population of 2 million (with a population density of 36 inhabitants per hectare).

Bucharest represents the political, economic, administrative and cultural centre of the country, with clear occidental tendencies in all its respects. Due to its dimensions – at least five times bigger than any other Romanian city – and also to its status as the nation's capital, the administration of city services involves special issues that require special means and structures to solve.

A considerable area of agricultural land still exists within city limits. In the north of the city there is a large forest, Baneasa-Tunari. Along the urban perimeter, there is a series of lakes bordered by green areas, and within the limits of the built territory there are many green areas and water surfaces (these occupy 35 percent of the city surface). Bucharest has a compact urban area and a richness of green zones and lakes that give it the potential for successful urban development.

The current urban development plans take into consideration the physical-geographical conditions of the area and impose certain directions, both for the transport network and dispersion of the attraction poles. At present, Law No. 50 of 1991 (concerning the authorisation of construction and some measures for house building) is the basic law that prescribes procedure and norms for building and land use.

Law No. 50 of 1991 stipulates in Article 2: "The building permit is issued on the basis of respecting the documents of urban and territorial development approved in accordance with the annex, which is an integral part of this law." The annex shows documentation for urban planning and territory arrangement with the organisations in charge of assent and approval.

The Territory Arrangement Plan should be prepared from the national level down to the communal level. The General Urban Plan (PUG) runs from the municipal level to the "village level" and for resort areas. The Zonal Urban Plan (PUZ) is prepared for the central part of each level of administration and for zones of special use or protection. The Detailed Urban Plan is a set of documents required for every construction project in the urban area and classified into two categories: national and local.

Bucharest Municipality is now preparing its Regional Territory Arrangement Plan (PATZ) that covers the Bucharest metropolitan area (BMA), including peripheral communities, as well as the PUG within the municipality.

### Characteristics of the transport network

Bucharest's transport network features:

- an incomplete radial-circular road network (nine radial arteries, two semi-circular arteries and one outer circular artery at the edge of the urban area);
- an inter-regional/international railway network, with a terminal point at Gara de Nord (Northern Station) on the inner traffic ring, and on the outer traffic ring a railway line for freight transport for the factories in these areas;
- an underground railway network that links the city centre to the industrial/residential areas along every radial direction, and a circular route below the inner traffic ring (used as a link between local points of interest: Gara de Nord and Obor); and
- surface networks for other transport modes such as trams, trolleybuses and buses, which are poorly integrated, both with each other and with the underground.

### Attraction poles

Areas of interest to the public have a large impact on the mobility of the population, and therefore on public trans-

port needs. The following factors influence the balance of public transport in Bucharest:

- concentration of activities regarding luxury trade, education/culture, health and administrative services, as well as the historical structures in the city centre;
- transformation of some old buildings located in the city centre (ex-residential areas) in commercial areas;
- suspension of construction works on a considerable number of blocks of flats in the city centre;
- change of the relationship between home and the workplace, and increasing distances have resulted in the stagnation of industrial activity (prior to 1990 there was a programme in which high blocks of flats were built for workers near industrial platforms);
- existence of small or medium-sized factories within the perimeter of residential/commercial areas;
- construction of medium- or high-quality living spaces in suburban areas;
- recent construction of large commercial centres in suburban areas aimed at affluent car owners;
- wholesale storehouses near the border of the urban area; and
- agricultural surfaces and vast forest areas in the suburban area to be built up.

## Urban mobility and quality of environment in the Bucharest area

Although a city is, in many ways, a superior arrangement of habitation, it is a dynamic system that depends heavily on other environmental systems and sub-systems. A study of the relations between the physical-geographic framework and guidelines for physical development of Bucharest's urban area must take into account the impact of any extension on the systemic functions of the city. The structure of transport infrastructure plays an important role in urban development; satisfying mobility need in turn, impacts the environment.

Urban mobility is bringing significant changes to the Bucharest area. It is necessary to draw up some mobility scenarios adjusted to the "personality" of urban structure. In this context, transport is an important factor for development, and accessibility to functional areas of the city has to be a priority of urban-territory planning and transport network planning. Thus, the links are clearly defined among urban-, transport- and environmental strategies.

Urban transport strategy is related to principles of urban development. It takes both the satisfaction of mobility needs and environmental impact into account. From this point of view, improving the quality of environmental parameters in Bucharest refers primarily to improving air quality and decreasing noise and vibration levels, with priority given to central areas and residential districts.

The evaluation of environmental conditions in the urban area of Bucharest was included in the Transport Master Plan carried out by JICA. The conclusions of the study about quality of environment factors were the following:

- The transport sector plays an essential role in the quality of the urban environment and the environment in general. Transport contributes heavily to pollution levels, and different transport means are the main source of nitrogen dioxide ($NO_2$) and carbon monoxide (CO), which are the principal pollutant compounds in the urban environment. The harmful effect of pollution on health is more powerful in the urban environment, where most of the population lives. On the other hand, transport plays a key role in economic activities and increasing travel convenience.
- The considerable impact on the environment by the road transport sector is due to emissions of nitrogen oxides ($NO_x$), carbon monoxide (CO), volatile organic compounds (VOCs), lead and other particulate matters (PM). Those substances affect not only ambient air quality directly, but also some substances causing adverse pollution, such as photochemical smog.
- The emission volume of each substance is related to vehicle speed, where the emission volume is greater at low speeds.
- In a comparison between Bucharest and other European cities, Bucharest is less polluted from $NO_x$, sulphur dioxide ($SO_2$) and carbon dioxide ($CO_2$), but more polluted with particulates, lead and VOCs. Particulate matter and lead concentrations sometimes exceed the standard values. These substances have larger concentrations in the city centre, where traffic volume and congestion are greater.

A vehicle's technical specifications are an important factor in its emissions. In conformity with the survey carried out by the Romanian Auto Register, 68 percent of all registered vehicles in Bucharest do not correspond to EURO2 standards from the point of view of technical conditions. This percentage includes the bus fleet belonging to RATB. Of the entire fleet, only 40 percent meet European standards; the others have classic engines.

Regarding the fuel types sold in Bucharest during 1995-2000 — leaded petrol, unleaded gasoline and diesel oil — the shares are 59 percent, 7.2 percent and 33.8 percent respectively. According to statistical data, leaded gasoline represents 89.1 percent and unleaded gasoline 0.9 percent of the total petrol sold. The large amount of leaded petrol sold is the result of the large number of vehicles that fail to meet European standards.

The growth of registered vehicles from 1995 to 2000 is 4.7 percent on average, with large growth in private cars, lorries, trailers and motorcycles. In conclusion, the volume and technical conditions of private cars would have to be considered

as a major source of pollution in order to mitigate air pollution in Bucharest. Table 1 lists technical measures in place in the EU that reduce environmental impact, and the corresponding situation in Bucharest and Romania as a whole.

## Analysis of traffic tendencies in the study area

The General Urban Plan regulates and guides city development and land use policies, including policies regarding the extension of the public transport network in Bucharest. At present, the road network in the study area (Bucharest and its metropolitan area) includes the streets that belong to the peripheral inner traffic ring (administered by Bucharest Municipality) and the road network that links the towns in the metropolitan area (administered by the Ministry of Transport).

Bucharest's road network of is structured mainly on two concentric (central and peripheral traffic rings). It has a radial and circular distribution and a total length of approximately 1,900 km. The distance between the main streets in the central area (the inner traffic ring) is roughly 1 km on the east-west axis and 2-3 km on the north-south axis.

Traffic volume on the boulevard network (nine boulevards converge on the inner traffic ring and city centre – Piata Unirii) and can reach 50,000 vehicles per day in both directions. At the same time, traffic congestion has caused more and more problems, reflecting the accelerated rhythm of individual traffic.

The congestion points are located in the main intersections along the inner traffic ring, in the central area and on the roadway along the north-south axis. Congestion has a negative impact on travel times, air pollution and parking problems. The city does not have enough parking facilities in the central area, which leads to the occurrence of "parasite" parking spaces on the roadway. The city's traffic management is currently done by using a traffic light system that covers 240 intersections (it has a synchronised flows only on the arterial roads) and the one-way traffic system implemented in the central area.

**TABLE 1**

### Comparing transport-sector measures to reduce pollution in the EU and Romania

| EU | ROMANIA/BUCHAREST |
|---|---|
| **Technical measures** | |
| Emission standards on CO, VOCs, $NO_x$ and PM for all types of motor vehicles | • RNTR 1 – Romanian Car Register<br>• Air Quality Standards – STAS 12574-87 |
| Fuel-quality standards concerning lead, sulphur and benzene | • Technical Conditions for Atmosphere Protection, Annex 4: MFWE gasoline features (STAS 176-80) and diesel oil features (STAS 240-80). MFWE contains the norms for gasoline quality |
| Noise standards for motor vehicles | • Only for type approval executed by the Romanian auto register<br>• Regulation 51-EU (with the amendments 51.01 and 51.02), transposed in entirety from the European legislation |
| **Construction measures** | |
| Low noise asphalt, noise protection walls along major roads | No legal regulations |
| Integration of transport infrastructure into the landscape | Ordinance No. 43/1997 governs road transport |
| Bridges and tunnels for animals crossing roads and railways | No legal regulations |
| Transport planning and traffic management | Ordinance No. 44/1997 governs road transport |
| Provision and improvement of public transport facilities | There are some decisions made by local authorities |
| Provision of separate cycling lanes along roads and in cities | No legal regulations |
| Restriction of car use in inner cities and residential areas via pedestrian zones, speed limits, parking restrictions, road safety measures, and alternate odd and even number plate access; | There are some decisions made by local authorities |

**TABLE 1 (CONTINUED)**

## Comparing transport-sector measures to reduce pollution in the EU and Romania

| | |
|---|---|
| Extension of rail, waterway and combined transport | • Ordinance 42/1997<br>• Ordinance 43/1997 – Roads<br>• Ordinance 44/1997 – Road transport<br>• Law 129/1996 – Railway transport<br>• Government decision HG 190/1997 – Activity contract of SNCFR (the Romanian Railway Authority) |
| Bans on through traffic | No legal regulations |
| **Economic instruments** | |
| Internalisation of external costs for all transport modes through taxes and fees (e.g. energy tax, fuel tax, road pricing and parking fees) | • Law 118/1997 (regarding the setting up of a special fund for the public roads)<br>• There are some taxes for the use of the Danube-Black Sea canal and for civil airports<br>• There are some parking fees in urban zones, locally established (for Bucharest, Decision DPG 1558/1994) |
| Differentiated purchase taxes (e.g. leaded and unleaded fuel) | Only for petrol (unleaded is cheaper) |
| Scrap benefits to encourage owners to replace older polluting vehicles with cleaner vehicles with catalytic converters | For the moment, there are only small discounts on excises paid for imported cars that respect EURO2 |
| Differentiated transport taxes (e.g. in the EU) ordinance 72/1998 | Law 118/1996 (roads tax), completed by government |
| **Other** | |
| Regular in-service emission tests for vehicles | RNTR 1 – Romanian auto registry: periodic technical inspections, according to minister of transport order 353/1998 |
| Time restrictions on transport movements (e.g. bans on night and weekend driving for heavy vehicles) | Local authorities decide these restrictions locally. For Bucharest there are some decisions regarding heavy freight vehicles (HCLMB 18/1992, HCLMB 18/1993, DPG 67/1993) |
| Lowering and enforcement of speed limits for vehicles | Decision of modifying and completing Decree No. 328/1966 (March, 1999) |
| Educational campaigns | There is no plan at the national level. Locally, the traffic police and NGOs have occasional events |
| Carrying out an existing resolution (e.g. European Conference of Ministers of Transport resolution on transport and environment (No. 66) and power and speed (No. 91/5) and conventions (e.g. Sofia Protocol for $NO_x$ emissions) | EU directives (e.g. EURO2) |

# Analysis of public transport systems operating in Bucharest

The main public transport operators in Bucharest are RATB — the surface public transport operator under Bucharest Municipality — and METROREX — the metro network administrator, subordinated to the Ministry of Transport.

Even if Bucharest has a solid public transport network of trams, trolleybuses, buses, underground rail, and maxi-taxis, the vehicles of the fleet used by the public transport operators cannot cover transport demand, due to the following:

- The fleet has an insufficient number of vehicles.
- Average wear of the fleet is over 60 percent.
- The infrastructure of surface-rail transport is, on average, 65 percent worn.
- There is no independent public transport authority.
- There is no specific information regarding the volume and dispersion of public transport demand in the territory.

The public transport structure, the quality level, the bringing of operational costs to an acceptable level, developing and achieving an integrated, high-quality public transport – all of these depend on political and administrative commitment, as well as on their social and economic implications reflected in the city's dynamism and functionality.

## Analysis of mobility and modal split in Bucharest

Studies were made on people's travel choices in order to establish the travel needs within the city and its metropolitan area. Three main mobility stages were determined, irrespective of transport modes:

- daily travel alternation from/to home and office (generates the most significant traffic flows during peak hours);
- visits made during spare time in areas of interest endowed with social-cultural–, sports– and shopping facilities; and
- short trips for urban and extra-urban recreational areas for rest and relaxation.

Public transport covers 80 percent of the 5 million daily trips in the metropolitan area. Based on the origin-destination polls carried out by specialised institutions (PROED S.A.) during 1993-1995, the following modal split was estimated:

- 6 percent – pedestrian walks (registered in 15-20 minute isochrones);
- 9 percent – trips by individual transport modes;
- 65 percent – trips by surface public transport modes (RATB fleet), including trips taken to the suburban area;
- 17 percent – trips by underground; and
- 3 percent – trips by maxi-taxis and taxis.

With its 2 million inhabitants (and a population density of 36 inhabitants per hectare), the city of Bucharest has all the characteristics of a metropolis. It represents the political, economic, administrative and cultural centre of the country, having an obvious tendency towards the "western" way of life in all its respects. The capital is also the first and most direct promoter of the Romanian image to visitors. Due to its dimensions – at least five times bigger than any other Romanian city – and also to its status as capital, public service management raises special issues – the solving of which requires special means and structures.

A well-balanced and motivated analysis of public transport functioning, of its effects on economic and social activities, on the environment and urban landscape, can begin by underlying its particularities as compared to other activities. A different approach must be used so that some of the general economic criteria should not lead, by a simplified manner of application, to misdirected actions and conclusions. The "efficiency" criterion, in particular, requires an analysis that takes into account all aspects exceeding the restricted framework of the public transport operator.

Travel needs depend directly on the intensity of economic and social life and increases in living standards, due in part to the tendency to separate residential areas from industrial areas. More than that, transport demand around large cities reflects their "areas of economic influence." From this perspective the importance of public transport is due to its advantages over private transport: bigger capacity at the same degree of carriage occupancy, with lower energy consumption and pollution (per passenger-kilometre).

The general advantages brought to society by this travel mode provide the motivation to endorse some active measures for protection and encouragement, namely: protected tariffs and traffic facilities. The use of private cars is discouraged by introducing access restrictions and high parking rates in the city centre, in addition to actions taken by authorities to promote public transport.

A typical challenge in achieving a proper understanding of and support for public transport development in Bucharest is pointing out the indirect benefits. These benefits are equivalent to the price paid by society for a possible lack of action in the field, with major effects on energy consumption, pollution levels, urban sprawl, road capacity and traffic safety. At present, Bucharest supports all these costs, and the environmental costs are higher and higher.

The benefits of public transport are, however, dissipated in fields where we do not yet know the dimensions of final energy, environmental and social costs, but also "geographic" time, for economic enterprises that have neither the habit nor interest in admitting the advantages of their activities. For example, we can demonstrate a 1 percent decrease in general fuel consumption, which is an effect of public transport systematisation in an area with 10 major intersections. It is difficult to express these effects in figures, but it is a compulsory activity, at least when the feasibility studies are carried out for international financing.

The structure of public transport in Bucharest, is based on two principles:

- meet all the inhabitants' needs; and
- maintain continuity in operations.

Surface public transport service is characterised by intense requirements over a short period of time, various loading degrees according to travel directions, served areas and characteristic periods of the day, integration of general traffic, and the crossing of numerous conflict points. In order to provide a high-quality service, it is necessary to have regularity, an average speed compared with general traffic speed, an acceptable degree of comfort, geographical proximity to customer needs, and reasonable tariffs. Apart from these elements, there must be accessibility for people with special needs and for disadvantaged social categories that modern and civilised societies

should protect – children, the elderly, persons with physical disabilities, and low-income earners.

Urban public transport, which has become an important part of human activity, continues to be a problem in modern cities and is generally subordinated to political influences (trends). On the international level, technicians, economists and specialised authorities warn politicians more and more about the role of public transport in efficient land use and land arrangement, as well as the necessity to analyse this activity through indirect advantages, which are for all people, including those who do not use this service. These advantages justify the involvement of authorities in financing the development and operation of public transport, improper functioning or interruption of which hinders many fields of activity.

## Evolution of surface public transport in Bucharest (1989-2003)

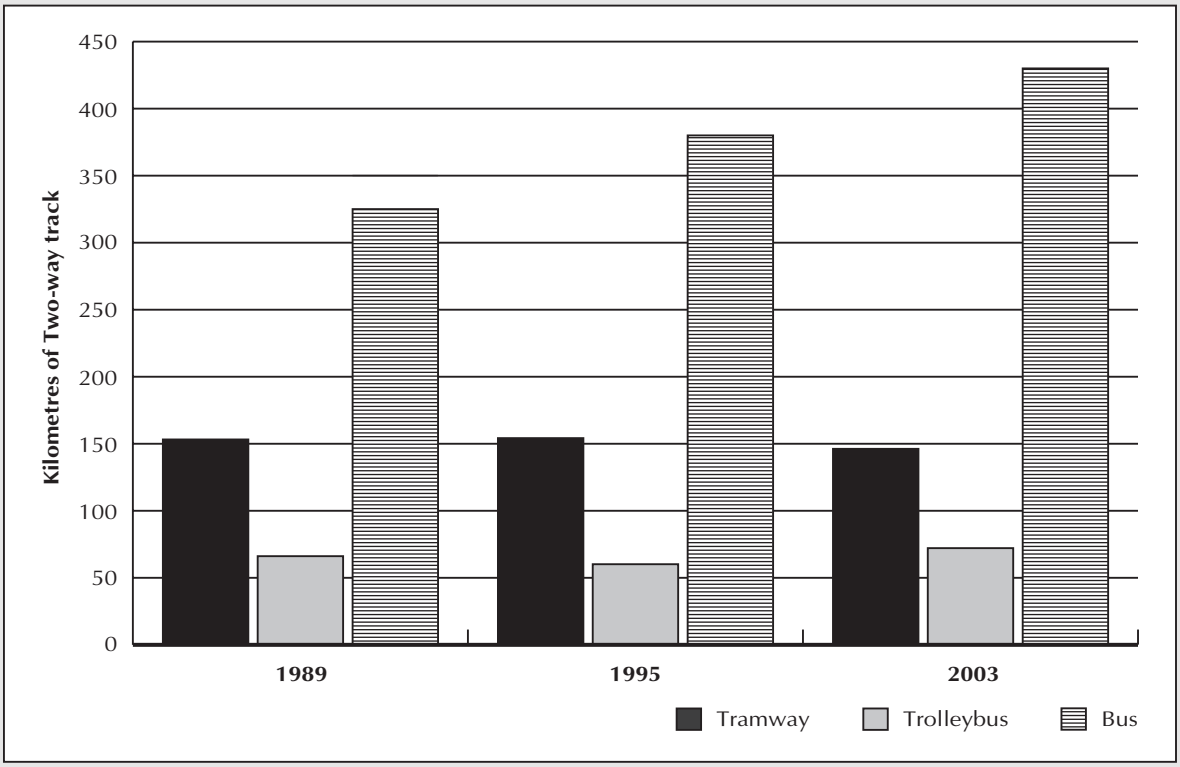
Any analysis of public transport after 1990 must start from the state of this service provided by RATB from 1989 to 2003.

After continuous degradation during a decade marked by deficiencies and arbitrary interventions, and which reached its climax with the total elimination of subsidies in 1988 and 1989, the situation of surface public transport in Bucharest became critical. During 1990-1991, programmes were established, based on a diagnostic report and a long-term study. Although these programmes could not be fully carried out due to financial difficulties, the progress made was obvious and, in comparison with other efforts, spectacular. The main indicator of the public transport service, which takes into account both qualitative and quantitative aspects (seats offered multiplied by kilometres) have registered continuous and favourable evolution. In this respect, the truth lies more in the street than in the figures, because the reference points employed have changed: The maximum calculated offer is different: it is not calculated at 8.5 passengers per square metre, but at 6 passengers/m$^2$, which is still far short of European standards.

The city of Bucharest has a solid public transport network, as well as urban and social premises that can promote and develop this activity. The light rail and tramway network, while featuring exclusively – or almost exclu-

**FIGURE 1**

### Operational network length, 1989-2003



sively – surface routes, offers the general advantages of electric transport, but also creates dependency on a fixed track and overhead network, which leads to an increased vulnerability to disturbance caused on its own or by general traffic. Acquisition and maintenance costs of the rolling stock are important, but obviously lower than underground railway costs.

The bus network is characterised by a large movement towards autonomy, rapid organisation and route modification and low initial investment (vehicles and street furniture, without infrastructure). Its disadvantages are lower reliability and higher pollution levels. Buses are favoured by passengers because of their greater mobility.

The trolleybus network is conceived as a feeder network for the underground and tramway networks. Trolleybuses can also replace some sections of the tramway route – normally in extremities of the network or in central and/or historical areas – where demand is lower, and to avoid the vibrations generated, which have a damaging effect upon old buildings.

Bucharest has developed on a radial road structure, on which the public transport network was laid. The network's length, covered by all surface public transport modes, increased by 104 km from 1989 to the end of 2003. Although some routes have been opened, and others have been reopened, the density and structure of the network do not meet transport demand. There are areas in the city where surface public transport is absent, or nearly: Calea 13 Septembrie, B-dul Mircea Voda, Cartierul Gherghitei, Cartierul Malaxa.

Figure 2 illustrates the increase in length of the bus network, mainly because of the extension of the covered area in the suburbs.

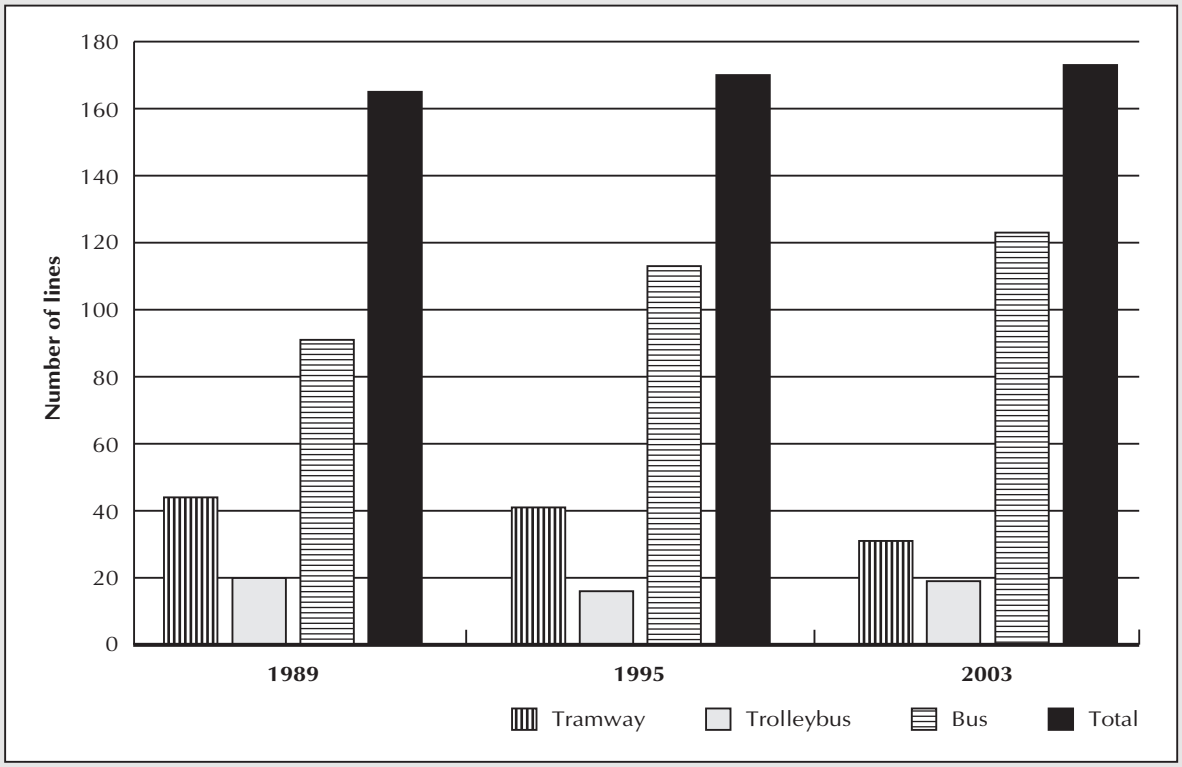
**TABLE 2**

## Average operating fleet

| | 1989 | 1995 | 2003 |
|---|---|---|---|
| **Total fleet** | **1,192** | **1,457** | **1,434** |
| Tramway | 397 | 389 | 360 |
| Trolleybus | 193 | 178 | 200 |
| Bus | 602 | 890 | 874 |

**FIGURE 2**

## Number of network lines, 1989-2003



The study period featured a decrease in length of the electric rail transport network. This situation was caused by the poor condition of the tram track, which had been constructed in the 1980s. The track proved unreliable, and there were severe deficiencies regarding operation and maintenance, as well as of discomfort from increasing noise levels and vibrations caused by tram traffic. During 1994-1995, RATB dismantled some sections of track with lower transport demand and obsolete infrastructure.

An analysis of the number of transport lines shows an increase in bus lines due to the extension of the transport network in the suburban area. The link between Bucharest and the localities in the neighbouring counties, on a radius of 40 km, is provided by RATB (with a few exceptions) by assigning 20 percent of its bus transport capacity for this purpose. Regional transport is necessary and must be developed, but the beneficiary communities do not contribute financially to the operational system, the entire difference in tariff being supported by the local budget of Bucharest Municipality.

The average distance between tram stops decreased from 0.528 km to 0.520 km due to restructuring of the public transport network. For bus transport, the average distance between stops has decreased from 0.635 km to 0.529 km, and at the same time the operational fleet has increased, which reflects an increase of the need for mobility and of the dispersion of attraction poles in the entire city area.

The average public transport speed of transport modes is decreasing due to the pressure of private transport on carriageways and on public transport vehicles, as well as the precarious state of the infrastructure.

The first light rail route, a transport system implemented for the first time in Bucharest in 2001, somehow modifies these average values of commercial speed. This transport system includes a constructive solution for the tram track to be segregated from general traffic, which gives greater autonomy in traffic and the possibility to reach a higher travel speed (25 km/h compared to an average of 13-16 km/h). See Figure 5 to see how public transport speeds have changed over time.

The number of passengers transported is an indicator derived from economic elements that are analysed based on information given by the volume of revenues for all types of RATB transport titles – free passes being added for some social categories.

**FIGURE 3**

## Bus fleet by engine type

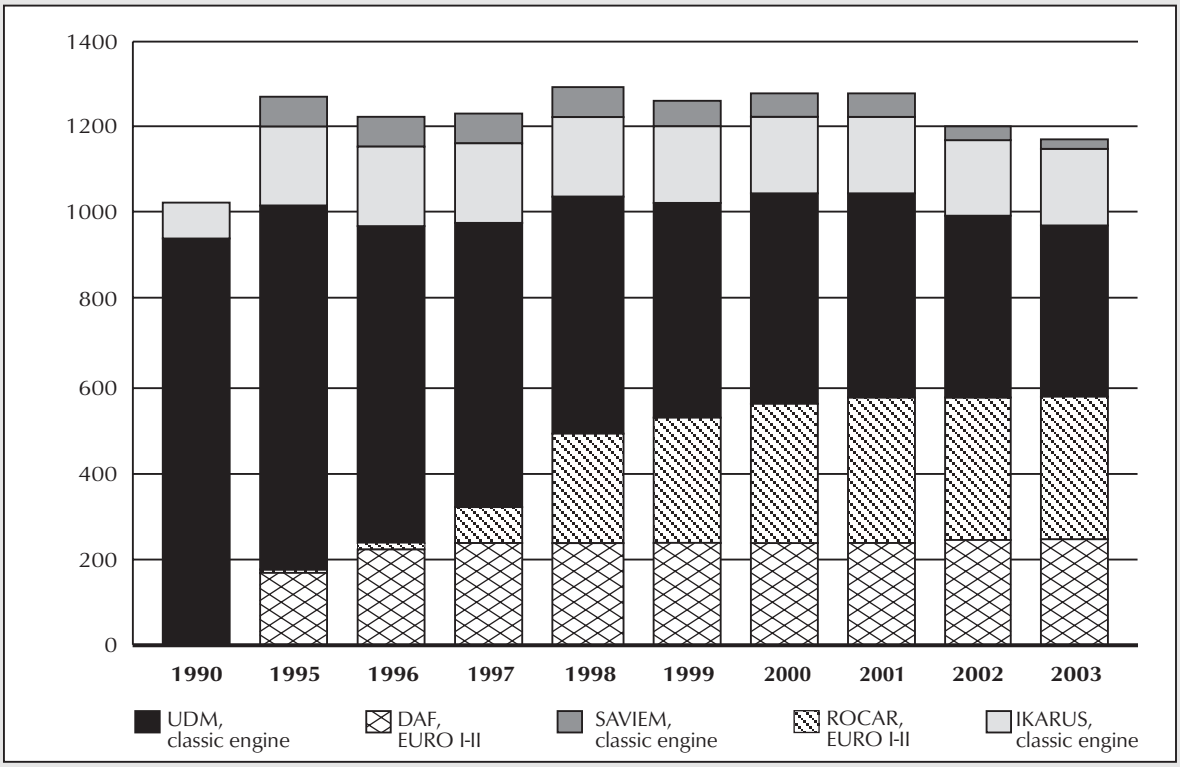
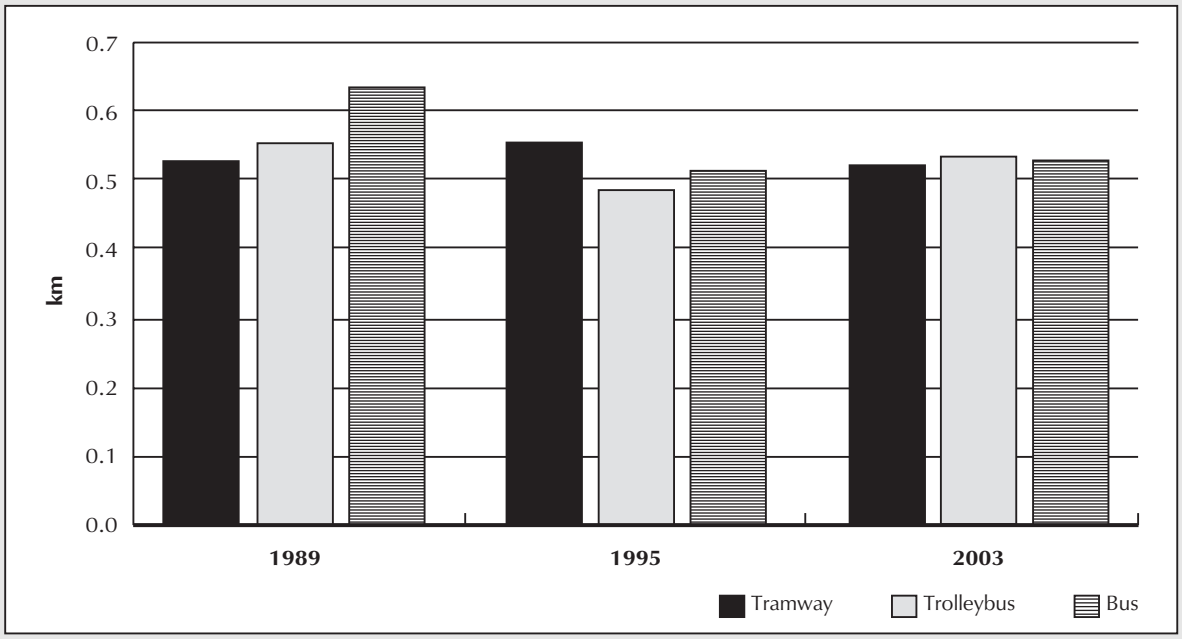


**FIGURE 4**

## Average distances between stops




It is estimated that, in the coming years, the intensifying use of private cars will drive down public transport demand by 1-3 percent per year. This tendency is due to the fact that there is no possibility to compensate for this phenomenon with an increase in public transport attractiveness. No drastic drop in the number of passengers using public transport is in sight, but transport demand will change in the following ways:

- Peak hours will shift (e.g. the morning peak will shift from 5:00-9:00 to 7:00-10:00).
- Travel directions will be modified due to diminishing industrial activity.
- Some residential areas will rise in prominence.
- Certain market segments will demand special services, such as higher speed and comfort.

"Loading" is expressed by the number of passengers per square metre of vehicle floor space. The lower the indicator value, the higher the quality of transport service offered to passengers. Service quality increased in 1995 and 2003, as compared to 1989, but fleet reductions have led to a slight increase of the indicator for tramways and buses.

The only reliable figures for loading degrees of urban public transport vehicles in Romania are the result of traffic surveys carried out in the Cars to Public Transport in the Urban Environment (CAPTURE) project (half-financed by the European Commission, Directorate General VII – Transport Research & Technological Development). The project's purpose was to assess the possibilities for modal and inter-modal transfer from cars to urban public transport on a European scale.

The traffic surveys were carried out in the summer of 1996 on two types of urban areas in order to study and compare general traffic behaviour. The areas chosen were:

- Central urban – B-dul Unirii; and
- Main circulation corridors – B-dul Iuliu Maniu (Pacii, Armata Poporului). The results of the surveys can be found in Table 3.

The occupancy for urban buses in Bucharest is estimated at 40 passengers per vehicle, as compared to 25-30 passengers per vehicle in developed Western countries. The last values represent a desideratum and we estimate the quality of transport services will increase in order to provide higher comfort levels for passengers. This is a very important aspect for viability and speeding up the modal transfer to public transport. The transport capacity deficit was estimated at 20 percent and this has negative effects on travel comfort, revenue levels and vehicle loads.

The main causes of this situation are:

- a dilapidated transport network infrastructure (track and roads), which inhibits everyday traffic and contributes, for example, to more than 200 incidents per year involving trams;
- continuous over-demand for surface public transport in areas with underground routes, due to poor route planning, average distance between stops and reduced transport offers (B-dul Iului Maniu, Cartier Berceni, Sos. Oltenitei, Cartier Titan, etc.); and
- the disorder that characterises Bucharest's urban traffic: illegal parking (including parking in the bus and trolleybus stops), non-observance of transport lanes and a bad traffic light system.

Public transport demand in a complex urban area cannot be covered adequately by one single mode. An optimal solution involves a major network of metro/light rail/tramway in a "spinal column" supported by a bus and trolleybus network. This solution is one of the common conclusions of consultancy and feasibility studies made by specialised companies. In accordance with these studies, the RATB's position is that this potential must be achieved through the rehabilitation of infrastructure and fleet inventory, and through good company management of the economic and institutional environment.

## RATB marketing strategy

The starting point for drawing up this strategy is the general downward trend of public transport demand by 1-3 percent per year, due to the increase of private transport use. The objectives of this strategy are the following:

1. Maintain the present surface public transport network, which is split into three transport modes: fixed tram network; flexible bus network; complementary trolleybus network.
2. Extend the new, light-rail transport system (LRV). Means: rehabilitation of some current tram lines for which transport demand exceeds 15,000 passengers per hour. Result: completion of a public transport system of medium capacity that could be extended to suburban areas to meet greater transport demand.
3. Reorganise the public transport system according to modern principles.
   Means: carrying out an integrated public transport system, based on the interaction of the current transport systems (including the metro); arrangement of multimodal stops; tariff integration (use of a unique transport title for all vehicle types belonging to the public transport operators); obtaining traffic facilities for public transport (dedicated lanes, segregated track, preferential traffic control system).

**FIGURE 5**

### Average speeds of public transport modes

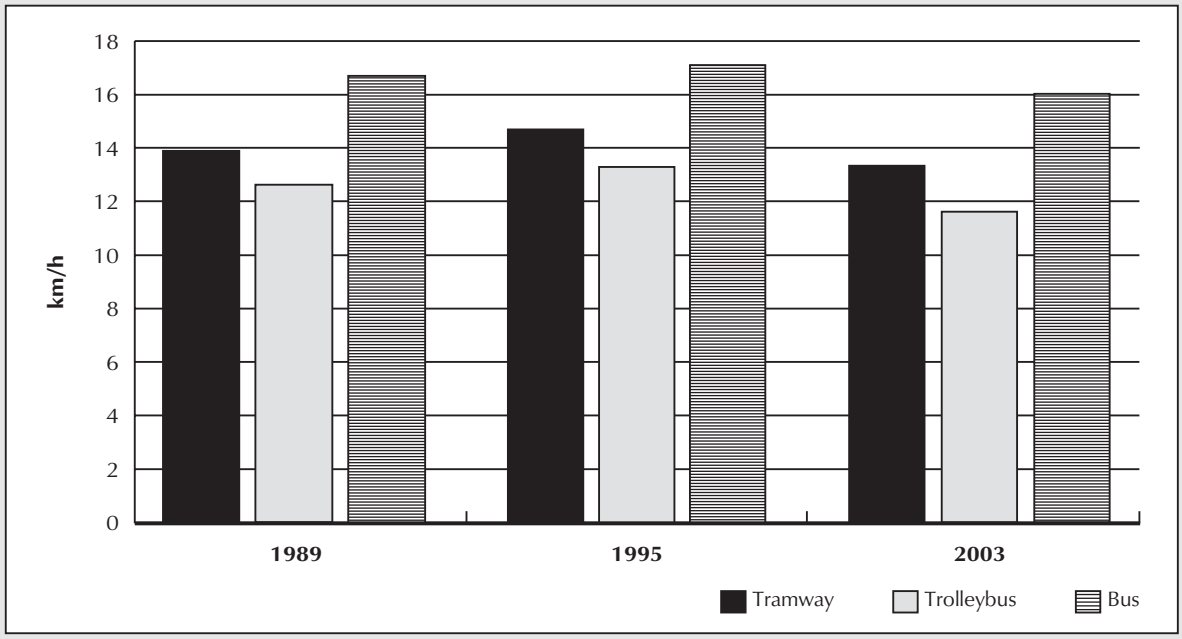
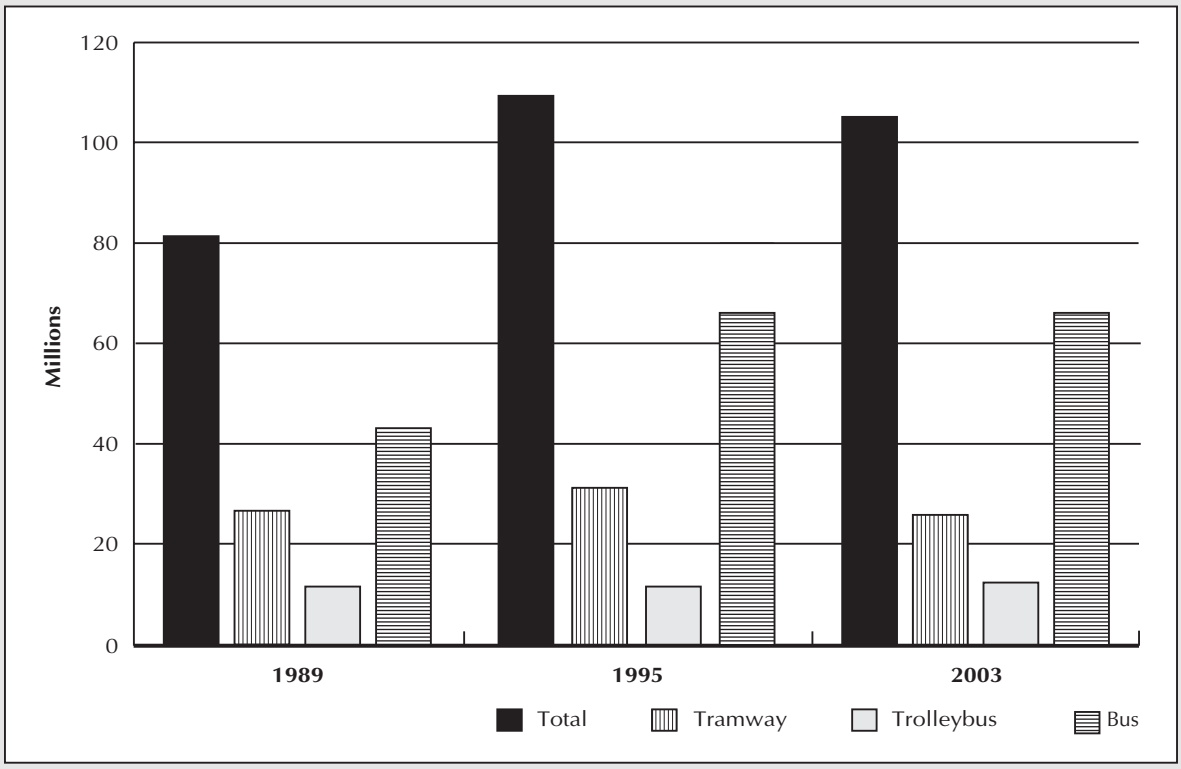


**FIGURE 6**

## Transport capacity (total kilometres)




"Vehicle per kilometre" is a quantitative indicator that shows the evolution of transport capacity relative to vehicle characteristics.
A slight discrepancy exists for 2003 due to the removal of obsolete vehicles, which reduced the size of the fleet.

Result: improved service quality, increased attractiveness and travel speed, and reduced operational costs.

4. Proportion the fleet to best meet transport demand.
   Means: replacing worn-down buses and trolleybuses and renewing the tram fleet.
   Result: reduction of the transport capacity deficit, of fuel consumption, degree of chemical pollution and operational costs.

5. Diminish the impact of transport on the environment.
   Means: rehabilitation of tram and trolleybus networks, use of buses equipped with EURO2-standard motors.
   Result: reduction of noise, vibration levels and air pollution.

6. Modernise the fare collection system.
   Means: adopting a computerised system.
   Result: precise information on transport loading (loading degree), fraud reduction, management improvement of the circulating fleet; increased efficiency and attractiveness of public transport activity as a result of tariff integration between RATB and other public transport operators.

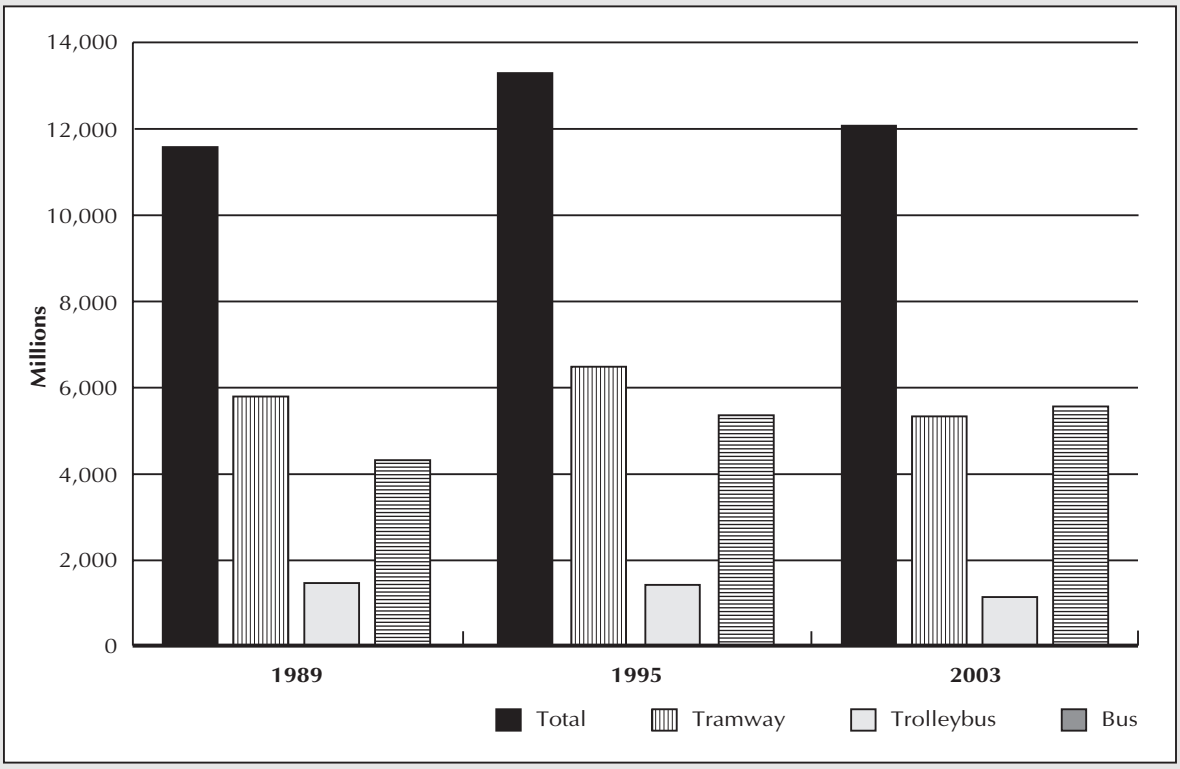
7. Introduce access facilities for people with special needs.
   Means: introducing low-floor transport modes, creating special access systems, and rearranging stops.
   Result: increased public transport attractiveness, and alignment with international standards.

8. Modernise passenger information systems.
   Means: adding general information items (maps, brochures) and displays in stops and on board vehicles.
   Result: increased public transport attractiveness, improvement of company image, reduced transfer times.

9. Install a high-quality computer system.
   Means: computer system modernisation by creating a real-time data collection system, procurement of vehicle identification and tracking system (GPS).
   Result: optimising traffic management and reducing operational costs.

**FIGURE 7**

**Coverage of transport demand in terms of seats per kilometre**




The "offered seat per km" indicator, calculated at 6.5 passengers per square metre, illustrates how well the transport system covers transport demand.

10. Improve RATB's financial parameters.
    Means: reducing operational costs and diversifying financing sources.
    Result: halving operational subsidies and alleviating pressure on the local budget.

Several of these objectives have been achieved or are in progress.

## Subsidies for surface public transport

Surface public transport has always been subsidised in Romania. In the 1990s, especially between 1995 and 1997, there were successive tariff increases for surface and underground public transport, as well as significant increases in fuel prices.

Public transport has a strong social aspect, which explains the high percentage of tariff subsidies. Generally, the municipality bears 70 percent per trip of the cost for surface public transport. The subsidy received by RATB during 1990-1995 was between 72 percent and 82 percent of total revenues. The purpose of this measure was to maintain a high level of public transport use.

The local budget of Bucharest Municipality benefits from state budget allowances for subsidising some investment activities. The amount takes into account an estimate made by the local authority (Bucharest Municipality) on the transfers needed from the central budget. The proposals for budget allowances are submitted for approval to the Ministry of Finance, but the approved amounts are generally less than required.

At the national level, the Ministry of Finance has established a policy to guarantee social protection, and it approves tariffs and subsidies for public transport. Because government policy is oriented towards the market economy, public transport efficiency is a priority. Consequently, RATB has implemented a series of measures to increase the efficiency of its activities by separating some auxiliary activities (a complete overhaul, construction of tram track, the washing of vehicles) from the main activity of passenger transport.

The percentage of subsidies allocated to RATB, as compared to the percentages of subsidies allocated to other transport companies in large cities around the world — companies whose performance parameters are similar to those of RATB — is at a high level (see Table 4).

The significant subsidy reduction is due to the fact that the municipality faced an acute financial crisis that made it impossible to grant budget allowances in the amounts required and justified by RATB in compliance with the norms in force. The subsidy for 2003 was 20 percent lower. The impossibility to allocate the calculated amount led to the restriction of RATB's activities.

RATB's financial resources include:

- revenues from tickets and monthly passes sold at RATB's own centres of sale (which represents approximately 30 percent of the costs);
- the tariff difference allocated by the Local Council, which is calculated in accordance with the Methodological Norms of the Ministry of Finance and represents the social protection offered to certain categories of citizens; and
- budget allowances to cover capital expenses, in compliance with the Law on Public Finances.

In order to reduce pressure on the local budget, the efficiency and attractiveness of public transport service must be increased. The primary way to do this is through investments in infrastructure and fleet modernisation.

The development of public transport costs less than urban plans intended to cope with the explosive increase in individual traffic. The efficiency of public transport must not be gauged by operational revenues, but rather by the indirect advantages for the urban community (increased environmental protection, low fuel consumption, comfort and safety).

Public transport does not benefit by financing from environmental funds. An environmental fund was established in Romania in 2002, but has yet to become fully operational. No private-public partnership agreement has been concluded in Bucharest.

**FIGURE 8**

## Passengers transported per year per mode

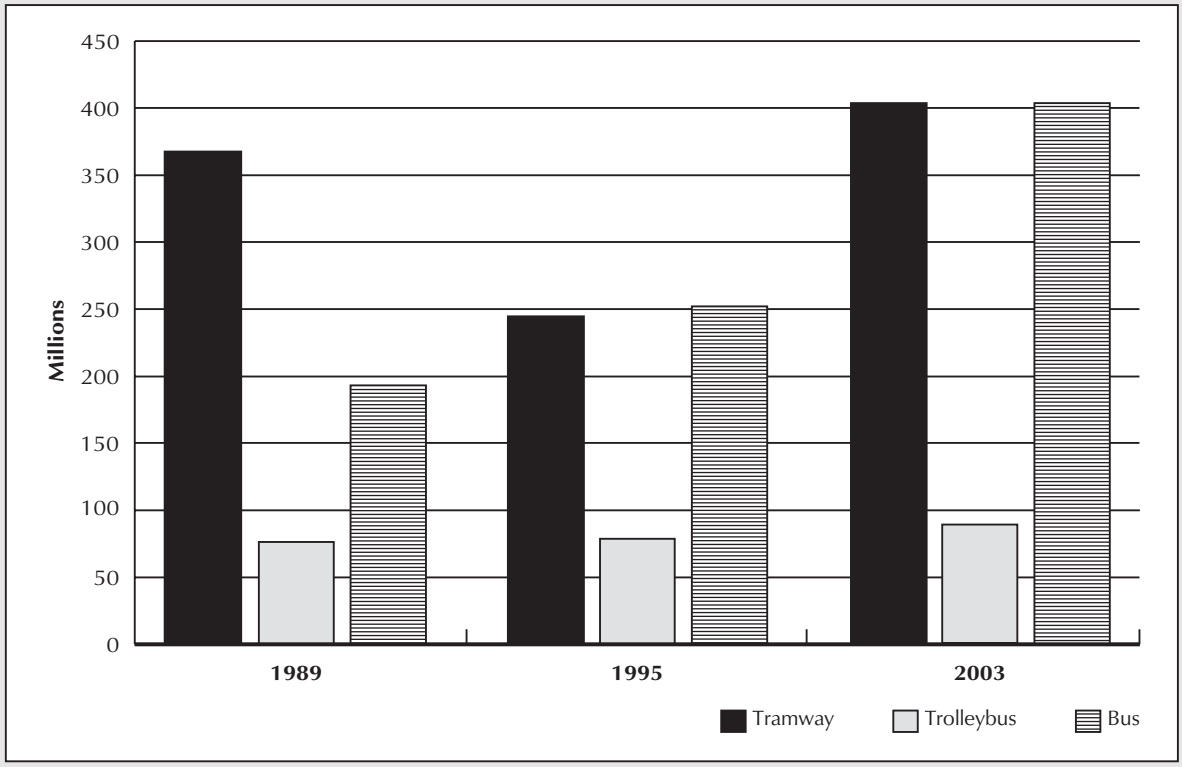
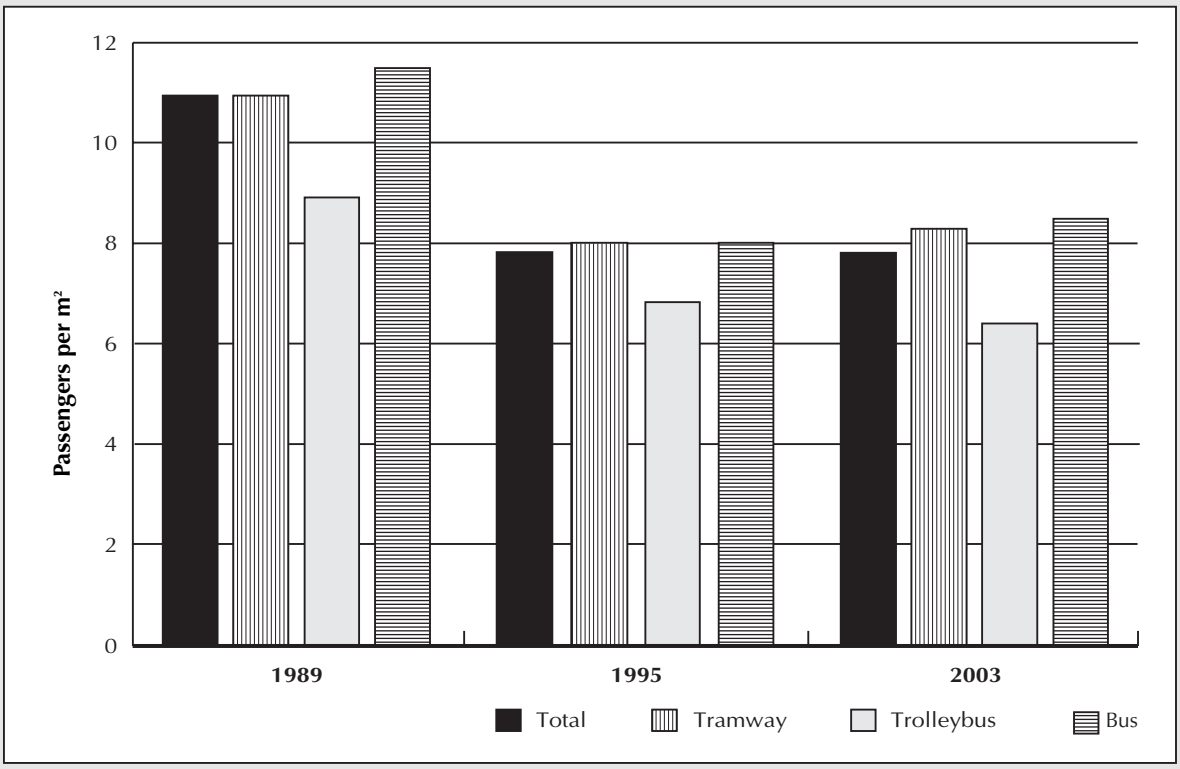


**FIGURE 9**

**Loading degree per vehicle**




## Financing investment programmes and state contribution for infrastructure projects

Experience tells us that those countries with long histories of public transportation have enjoyed state support for financing major infrastructural works – works that could not be otherwise carried out by funds from independent operators or local budgets. This is especially true for the infrastructure required for rail transport, which offers maximal capacity, specific energy consumption and an environmentally friendly attitude, but this is extremely expensive and does not have any benefits – especially with controlled tariffs. Under these circumstances, privatisation and granting are out of the question, and the public transport operator must lay out a significant amount of capital. According to the present European concept (as applied to national railway transport), performance infrastructure is the responsibility of local and central authorities, on the basis of some strategic and social measures. Infrastructure is available for freely titled public operators within a contract that sets out, among other things, the relation between allocated resources and operator performance – especially transport offers compared to operational costs.

As for Bucharest, the situation requires the central authorities' involvement in performing the investment works, including guaranteeing some external loans. Considering the local character of the activity, the volume of these investments – absolutely necessary for quality service – exceeds and will continue to exceed the possibilities of local budget, which was even increased because of the new legislation. Investments, especially those for infrastructure, are extremely expensive, and their achievements are directly conditioned on positive effects in order to increase the operational efficiency. It is, in fact, fully required and justified to divide this effort between local and central authorities – a respective ratio of 40/60, for example.

The current level of subsidy is 66.3 percent, and this falls among the higher values reported by other administrations. The specific condition of public transport and its significant role in the social-economic life of the urban community present a particular approach to financing.

**TABLE 3**

## Traffic survey results

**Average capacities**

- Bus: 100 passengers
- Trolleybus: 100 passengers
- Tram: 250 passengers

**Bus-loading levels**

- Level 1 – up to 20%
- Level 2 – 20-40%
- Level 3 – 40-60%
- Level 4 – 60-80%
- Level 5 – 80-100%

**Traffic survey results**

- Unirii Boulevard
  - private cars: 1.59 passengers per vehicle
  - buses: 64 passengers per vehicle (3.2 loading degree)
- Iuliu Maniu Boulevard
  - traffic on main circulation corridors
  - input/output from Bucuresti-Pitesti highway
  - private cars: 1.98 passengers per vehicle
  - buses:
    input: 56 passengers per vehicle (loading degree 2.8)
    output: 40 passengers per vehicle (loading degree 2)

**Summary of previous results: the following loading limits are for peak hours.**

- Private cars: 1.59 (urban central traffic) with 1.98 passengers per vehicle (traffic on main circulation corridors)
- Buses: 40 (traffic on main circulation corridors) with 64 (urban central traffic) passengers per vehicle

The situation in Bucharest is different from other European metropolises; not necessarily with respect to the percentage of subsidy, but in comparison to the level and sources of the local budget allocated for public transport. The lack of financial resources has led to a significant gap between transport demand and supply, as well as to some quality problems of the public transport service. On the other hand, due to the fact that the local budget is the only source for subsidy, the role of public transport is not mirrored properly in the socio-economic life of the city. The benefits received by economic enterprises in the areas covered by public transport should be reflected by development resources offered to public transport operators.

## External financing sources

Compared to the great need for funds, especially for infrastructure investments, the shortage of financial resources, which could be available for RATB from the local budget, is obvious. Obtaining an external loan is not a problem in itself. There is money, but it is something that has its price – interest, guarantees, assurance and costs for handling the credit. The business plans submitted, the feasibility studies, political support, present economic situation and its perspectives, country's risk factors, and the investment policy of the financing banks are crucial factors towards achieving success for receiving and managing a loan.

As for public transport, the loan objective – (investments for infrastructure) and the reimbursement source (the public budget) require restrictive conditions beyond the offer of a commercial bank, and beyond what a public company can accept: maximum interest of 6-7 percent, a grace period of minimum three years, and a minimum reimbursement period of 15 years. Therefore, reimbursable financing is allowed only from some other international specialised financial institutions – the World Bank, EBRD, EIB, as well as from some banks in countries with great financial surplus, like Japan. For complex reasons, these banks grant loans with profitable conditions for infrastructure investment projects provided they are guaranteed by the Romanian government.

On the heels of the first loan of EUR 63 million obtained from EIB (and completed with an equal allowance from the local budget) for modernisation of the tram network in southwest Bucharest, RATB intends to follow the same path towards continued rehabilitation of its own infrastructure. At the same time, it has tried to identify complementary and non-reimbursable sources: EC funds for environmental restructuring and protection, governmental funds available due to bilateral agreements, and others. For instance, Dutch assistance is part of this final category for achieving traffic management for the first light rail in Romania and for a pilot project to introduce transport systems with low emission levels (LPG buses).

## Undertaking projects with external financing sources

The modern concept of public transport management and the present situation in Bucharest contends that the organisation of public transport should involve a trunk network covered with electric rail transport (metro, light rail, trams). It should be focused on areas with high population density and on corridors with high traffic flow. There should also be secondary and tertiary networks covered with buses and trolleybuses.

The secondary network has to supply stations of the primary network and to operate routes where demand does not justify the existence of the primary route. In order to take over some passenger flows under 10,000 passengers per hour and direction, lines should be created in a tertiary network.

With this in mind, a programme to rehabilitate the infrastructure in southwest Bucharest was drawn up. The proposed sections for modernisation within this project have been selected with the following considerations:

**TABLE 4**

## RATB subsidies

| **Parameters** | **RATB (1995)** | **RATB (2003)** | **International average value** (big cities) |
|---|---|---|---|
| Level of subsidy | 70% | 51.75% | 50-75% |
| Trips per inhabitant | 317 | 466 | 100-300 |
| Vehicle * km/employee | 5,900 | 7,132 | 10,000-15,000 |
| Vehicle * km/inhabitant | 43.8 | 54.8 | 30-40 |
| Trips/vehicle * km | 7.2 | 8.5 | 2-5 |
| Network density | 2 km/km$^2$ | 1.57 | 1.5-3 km/km$^2$ |

**TABLE 5**

## RATB financial sources

| **Years** | | **1989** | **1989** | **1995** | **1995** | **2003** | **2003** |
|---|---|---|---|---|---|---|---|
| | | **ROL mn** | **USD mn** | **ROL mn** | **USD mn** | **ROL mn** | **USD mn** |
| **Central budget** | **Revenues** | 423,473.5 | 28,382.94 | 14,684,300 | 7,221.97 | 241,235,500 | 7,266.11 |
| | **Expenditures** | 423,473.5 | 28,382.94 | 16,616,700 | 8,172.36 | 291,045,100 | 8,766.40 |
| **Level of local budget** | | - | - | 528,078.3 | 259.71 | 10,171,539 | 306.37 |
| **Revenues received from local budget** | | - | - | 233,696 | 114.93 | 3,281,484 | 98.84 |
| - operational costs | | - | - | 157,760 | 77.58 | 2,571,284 | 77.45 |
| - investment costs | | - | - | 75,936 | 37.34 | 710,200 | 21.39 |
| **Percentage** | | - | | 44.25% | | 32.26% | |

**TABLE 6**

## RATB expenditures

| **Years** | **1995** | | | **2003** | | |
|---|---|---|---|---|---|---|
| | **ROL mn** | **USD mn** | **EUR mn** | **ROL mn** | **USD mn** | **EUR mn** |
| **Operation costs** | 225,990 | 111.14 | 85.94 | 4,567,901 | 137.58 | 121.62 |
| **Tram** | 90,040 | 44.28 | 34.24 | 1,792,160 | 53.98 | 47.72 |
| **Trolleybus** | 31,474 | 15.48 | 11.97 | 631,009 | 19.00 | 16.80 |
| **Bus** | 104,476 | 51.38 | 39.73 | 2,144,732 | 64.60 | 57.10 |

**TABLE 7**

## RATB financial sources — revenue

| Years | 1995 | | | 2003 | | |
|---|---|---|---|---|---|---|
| | ROL mn | USD mn | EUR mn | ROL mn | USD mn | EUR mn |
| **Revenue from tickets and passes** | 66,865 | 32.88 | 25.42 | 1,237,417 | 37.27 | 32.94 |
| **Tram** | 28,752 | 14.14 | 10.93 | 555,672 | 16.73 | 14.79 |
| **Trolleybus** | 9,361 | 4.60 | 3.56 | 123,483 | 3.72 | 3.28 |
| **Bus** | 28,752 | 14.14 | 10.93 | 558,262 | 16.81 | 14.86 |

**TABLE 8**

## Trams versus light rail

| Transport Mode | Operation speed (km/h) | Frequency interval (min.) | System capacity (passengers/h/ direction) | Average distance between stops (m) |
|---|---|---|---|---|
| **Tram** | 12-15 | 4-10 | 700-4,500 | 300-400 |
| **Light rail** | 20-25 | 2-3 | 5,500-6,500 | 500-800 |

- technical condition of infrastructure;
- operational data;
- condition of other transport modes;
- unity and functionality of the area;
- organisation and works' performance capacity within the deadline; and
- financing capacity of investment and payment of external debt.

The modernisation programme of the tram track in southwest Bucharest is financed in equal proportions by the General Committee of Bucharest and the European Investment Bank. The contract was concluded in 1999 at a value of EUR 126 million. The loan provides for the rehabilitation of 110 km of tram track in southwest Bucharest, including four depots.

The feasibility study was made in 1999 and the programme will last five years. RATB has provided continuance of the loan, and contracts with suppliers and subcontractors are being concluded directly by RATB.

In Luxembourg, on November 16, 1999, and in Bucharest, on November 19, 1999, the Financing Contract between Romania, the European Investment Bank and RATB was concluded to finance the Rehabilitation Project for Public Transport in Bucharest. Ratification of the contract was made by Order No. 19 on January 27, 2000 and was published in the *Romanian Official Journal* No. 38 on January 29, 2000.

Financing for the investment project is guaranteed by an EIB loan (EUR 63 million) and allowances from the local budget of the General Council of Bucharest, according to the financing plan enclosed to the subsidiary loan agreement. The subsidiary loan agreement concluded between the Ministry of Finance, RATB and the General Council of Bucharest was signed on November 24, 2000.

The forecasts, after the completion of the project, are:

- The transport offer will be increased by 20 percent.
- Revenues will be increased by roughly 10 percent.
- Operational costs will be reduced (expenditures for maintenance and repair of track and electrical networks) by about 80 percent.
- Expenditures for maintenance and tram repair will be reduced by about 50 percent.
- Energy expenditures will be reduced by 15 percent.

Implementation of the first light rail route was accomplished from this rehabilitation programme. The results obtained are greater than those anticipated in the feasibility study. The operational differences between tram and light rail are significant, as seen in Table 8.

Advantages of the light rail transport system include:

- useful and feasible system, attractive from the point of view of infrastructure costs (3-10 times lower than those for the metro);
- cheapest public transport system regarding infrastructure lifetime (at least 30 years);
- no emissions, greater travel speed, safe services, higher degree of comfort compared to trams;
- possibilities to develop existing tram-network infrastructure; and
- easy adjustment to the urban environment.

The operational data of the light rail system has been modified significantly due to the use of segregated track. The extension of track for public transport, intended only for light rail, has the following benefits:

- avoidance of traffic conflicts, which creates minimum conditions for maintaining the timetable and increasing operating speed;
- increased passenger safety at stops through the construction of protective fences; and
- security for the access of track maintenance staff.

An experimental traffic management system was introduced on the light rail route in the interest of giving high priority to public transport by increasing traffic flow on very crowded networks and, thereby, showing public transportation as the most effective means of reducing the amount of lost time due to traffic jams.

Traffic Management assures prioritisation at light rail intersections, contributing to the achievement of optimal commercial speed. Implementation of this system also assures the possibility of keeping a record of the vehicles in traffic, as well as setting the operating hours. There are 11 traffic-lighted intersections in the SPOT/UTOPIA system, which facilitate the running of light rail. All of these intersections anticipate general traffic flows and set the traffic-light cycles.

Out of the Programme for Tram Infrastructure Modernisation in Southwest Bucharest, part of the works were carried out, and the constructive solutions of the track were changed for the tram section that links one of the most crowded districts in Bucharest (Rahova) with the central area. Modernisation improved the operation parameters of Line 32 and increased its attractiveness to users. In the future, according to provisions of the transport master plan issued by the Japan International Cooperation Agency (JICA), this tram line will be connected with another much used tram line (Line 21) for performing a transport corridor towards NE-SV.

## Tariff integration and a new fare collection system

The fare collection system currently used by RATB operates on inferior technology and, naturally, is performing at an inferior level. The system no longer corresponds to present company management requirements, and is not commercially viable in terms of a secure income. The system is extremely vulnerable to fraud by falsification of tickets, passes or free passes, and it does not provide any information regarding the real transport capacity and its distribution per lines, vehicles, period of time and trip structure.

A new fare collection system for RATB will keep its openness, but should offer complete data regarding transport capacity. It should make a more attractive tariff policy possible and it should offer better security for company revenues. Halving the present fraud that affects 25-30 percent of revenues obtained out of direct returns is a minimum objective, and fully possible through the securing of transport titles. The investment can be recovered from this source alone within at least five years.

RATB benefits from a programme, co-financed by EIB and the General Council of Bucharest (in the amount of EUR 14 million), to modernise the fare collection system. It contains a medium-term strategy that provides for an extension of the infrastructure modernisation programme for electric rail transport in north/northeast and east/southeast Bucharest. This programme will include rehabilitation of 150 km of single track, of which a great part will become light rail lines so that, in the future, city development will include the extension of this type of transport system, and that transport demands will be fully covered.

The development strategy is based on capital investments for infrastructure and vehicles, as well as on its own effort to restructe and increase work and management efficiency. Improving public relations and the company image are also taken into consideration as new elements within the sensitive balance between subsidised activity and an economic reality that is more and more competitive. Finally, there is need for financial and legislative-institutional support for public authorities. In our concept, all these elements can determine a public transport service at a level required by its importance to Bucharest city life.

## Conclusions

RATB's (Bucharest's main surface public transport operator,) experience of concerning efforts to offer an attractive transport service in difficult economic-financial conditions can be summarised by underlining the importance of capital investment for infrastructure and vehicles, as well as its own efforts to reorganise and increase work efficiency and management.

The light rail transport system is an attractive form of public transport that also presents numerous environmental advanages. It is also a cost-effective investment. Its other ben-

efits include avoidance of increased traffic congestion, less pollution, and enhanced passenger safety at stops.

Public transport will continue to be subsidised. On the one hand, revenues cannot balance operational costs due to the contrast between specific (high) costs and social expectations. On the other hand, in order to evaluate efficiency, one must not consider only the aspects related to bookkeeping, since efficiency is reflected in benefits difficult to express in figures: the degree of air pollution, crowded urban areas, energy and fuel consumption, comfort and safety.

RATB's objective is to lower the level of subsidy to 50 percent, and the achievement of this objective is conditioned by the continuance of the investment programme meant to bring down operational costs while at the same time, improve the quality of the public transport service.

A possible solution is to supplement RATB's budget with funds obtained by introducing a fee for economic enterprises with more than 10 employees (a method that other European cities, such as Paris, have tried). A contribution of 2 percent of wages applied to the economic enterprises in the area of influence in Bucharest would have a minimal effect on raising taxes and costs, but would represent 25 percent of the company's yearly investment needs.

A new fare collection system for RATB has been proposed that would provide complete information about public transport demand and allow for easier, more secure fare collection.

Improvement in customer relationships and of the company image is also being taken into consideration as new elements in a sensitive equilibrium between a subsidised activity and economic reality that is more and more competitive.

Finally, it is necessary to obtain financial, institutional and legislative support from public authorities. The barriers identified in obtaining financing from international financing bodies include:

- level of interest;
- grace period;
- reimbursement period;
- bank-required guarantees; and
- the Romanian economy.

We believe all these elements can create a good public transport service that will suit present and future needs for the city of Bucharest.

# Budapest, Hungary

## General data

Budapest was at the forefront of urban transport development in the first half of the 20th century. The "Millennium" underground railway line, M1, was the first on the European continent. It was completed in 1894, and the city's planned radial roads date back to the early commercialisation of the automobile. Two additional metro lines were built after WWII, and during the roughly 40 years that followed, the public transport system further expanded into a well-developed, multi-modal network. The system included three metros, suburban railway lines, and extensive street-based bus-, trolleybus-, and tramway lines. Prior to 1990, public transport modes represented 70-80 percent of daily urban trips, automobile use was low, and the urban transport network was much more developed than the road infrastructure.

Similar to the situation in other former Eastern Bloc cities, public transport was low-priced. The Budapest Transport Company (BKV), the operator of all urban transit services, recovered less than one-third of its operating costs from passenger fares. The balance was compensated from the central budget. The state also contributed capital grants for infrastructure improvement and rolling stock purchases. With the economic and political changes that began in the late 1980s, it became clear that BKV's public transport financing procedures were unsustainable.

Ownership of BKV was transferred to the Municipality of Budapest, as part of the Self-Government Act of 1990. The municipality received substantial real assets and the requisite fiscal and spending powers, including the right to borrow. However, decentralisation coincided with government austerity measures aimed at reducing the budgetary deficit – i.e. funds provided to local governments were constricted. On top of this, the government acted to prevent the municipality from proposed fare increases. Since the public transport fares are part of the consumer basket for calculating the consumer price index, as an inflationary control measure the government restricted fare increases, without corresponding compensation to BKV.

BKV experienced difficult transformation consequences following decentralisation. The Municipality of Budapest was unable to increase its revenue in line with reductions in compensation from the state, and this led to under-spending for vehicle replacement/maintenance and resultant difficulties in providing a high level of service. On the demand side, passenger numbers began to decline in the early transition years, as a result of economic recession and an employment shift from the industrial to the service sector. Unemployment and inflation increased, and real wages decreased among the lower income brackets of society. Meanwhile, the sectors of the economy experiencing dynamic growth quickly adopted an automobile-centred way of doing business, which in turn led to an increase in the development of suburban areas. Demand for public transport dropped and traffic congestion increased. BKV was faced with the challenge of providing quality service to a declining number of users.

BKV realised considerable reforms throughout the 1990s aimed at improving the financial position and performance of the company. The Municipality of Budapest also made substantial progress in its financial position, particularly with respect to developing its own revenue streams. Passenger decline has levelled off, and BKV continues to make inroads towards recovering more of its operating expenses from fares. However, BKV still does not fully recover its operating costs from all sources of compensation, liquidity has deteriorated, and working capital has been running negative for the last several years. Unable to maintain its fleet and facilities, the company has been running down its assets.

## Legislative policy and institutional developments

### Relevant legislative developments

Parliamentary Act LXV of 1990 on Local Self-Governments (with an important amendment: Act LXIII of 1994) initiated decentralisation of power to local governments. This act laid the legal framework for defining the role of

municipalities in local public-service delivery and infrastructure investments. The scale of local government expenditures is exceptional, due to the extensive responsibilities at the local level. Revenue sources for the local government budgets consist of four main elements: independent revenues, shared revenues, normative grants from the central budget, and capital investment financing. Act XXXIII of 1992 on Public Finances (important amendments: Act CV of 1995, CXXI of 1996, and CXLVI of 1997), reflects on the local governments borrowing capacity. Municipalities can borrow at their discretion within certain debt service limits.

The great number of tasks of the local government sector (including public transport) creates dependence on funding by intergovernmental transfers from the central government. The government provides funds for public transport in the form of compensation for revenue losses due to government-imposed fare discounts for students and pensioners. Otherwise, legally, the government has no other role in public transport services. In 1996, the government discontinued its operational compensation, which represented 7 percent of BKV's operating cost in 1995.

Act LXXXVII of 1990 on Pricing transferred to municipal authorities the power to set tariffs and prices of public utility services. In 1995-1996, substantial fare increases were realised, at rates considerably higher than inflation. For example, fare increases of 33 percent and 39 percent were approved in March 1995 and January 1996, respectively, while the 1994 inflation rate was 18.8 percent and the 1995 rate was 28.2 percent. Starting in 1998, fare increases were generally well under inflation, as the Ministry of Finance maintains leverage in tariff-setting as an anti-inflationary measure. The government pays no compensation for revenue losses due to its refusal to allow general fare increases at levels requested by the Municipality of Budapest (MoB). This has led to the reluctance of MoB in providing BKV with the financial support to break even, as the general feeling within the General Assembly of MoB is that the government should provide additional compensation due to their refusal to raise tariffs to levels proposed by the municipal authorities.

A new Passenger Transport Law, expected to coincide with EU accession, should help to promote a more conducive intergovernmental approach to financing BKV's operations. According to EU policies, if the compensation of losses is not provided for, state or local self-governments are obliged to exempt the service provider from carrying out activities causing losses upon request of the service provider — in some cases this procedure can severely disrupt the service activities. When taking their decisions, the authorities are obliged to select the transport modality causing minimum fiscal burdens.

Hungary passed the Act on Public Procurement (Act XL 1995 and an important amendment to Act LX of 1999), which is applicable to BKV's purchases from its own resources. A new procurement law, which conforms fully with the EU, takes effect on May 1, 2004. The law extends public procurement obligations to certain utility companies and entities using money coming from the EU cohesion and structural funds.

## Urban transport policies

Public transport planning in Budapest has developed from communist-era planning, to supply-oriented thinking, to integrated demand management. The first shift in urban development planning took place in 1991, and in 1994 a general master plan for the city was established. Throughout the 1990s, there was increasing coordination among transport, financial, and urban development strategies. A conceptual urban development plan was accepted by the General Assembly in 2000.

The major long-term urban transport policy objectives are to balance economic growth and social development measures, and to protect the environment. The key features of the urban transport strategy include (MoB 2004b):

- Improve the financial position and performance of BKV through a combination of revenue increases, operational improvements, and cost-reduction measures. Revenues will be increased through fare hikes, a new fare system and technology, fare unification to cover all metropolitan area operators, and action against fare evasion. Improved performance and reduced costs will be achieved through BKV plant modernisation, increased priority measures for street-based mass transport vehicles, service network rationalisation, adjustment of service standards to reflect demand, spinning off non-operational functions, and better organisation and management.
- Restrain vehicular automobile traffic in the inner city through a combination of traffic and parking management measures, including a new system of parking charges and better enforcement. The parking policy will charge car users for parking in the city centre, but convenient park-and-ride facilities will be provided in the outskirts. The introduction of road user charges will also be explored at a later date.
- Develop new sources and modes of public transport funding, including a link between net revenue from parking and public transport financing.
- Establish the Budapest Transport Association (BTA), an integration of BKV's operations with the Hungarian Railway Authority (MAV) and the national bus lines (Volan companies). The objective of the association is to offer integrated transport solutions for customers commuting from the suburban areas.
- Adopt private transport restraint measures, including pedestrianisation of city centres and promotion of bicycle and pedestrian travel, coupled with parking management solutions.

### BKV reforms

BKV was transformed from a state-owned enterprise to a joint stock company in 1996, managed by a Board of Directors. It is fully owned by MoB, which exercises its ownership rights in two ways: through majority representation on BKV's Board of Directors, and through an operational contract, negotiated annually.

BKV's internal organisation has been restructured and streamlined. Some activities were divested, and separate subsidiaries were formed for core services. Maintenance workshops were also set up as subsidiaries, with the intention of divestiture in the near future. Personnel was reduced by 38 percent: from 21,000 in 1995 to 13,000 in 2001.

Since 1998, the company has strengthened its marketing and public information activities by operating a system of upgraded "brand lines," which provide more comfortable service on some key routes. These service improvements, in addition to the procurement of new vehicles and improved tracks and roads, helped level off the loss of passengers, as seen in Table 1.

Operating costs were difficult to reduce, given BKV's fleet, which overall is still obsolete. BKV did manage to reduce total operating expenses in real terms by 20 percent between 1995 and 2001. The company has increased fare evasion inspection, but widespread illegal travel continues to deprive BKV of needed revenues.

The company has significantly changed procedures for procurement of renewed or replacement rolling stock and infrastructure improvements. The Budapest Urban Transport Project (World Bank 2001) allowed BKV managers to hone project management skills and shift from an engineering-dominated procurement process to a value-for-money and competition-focused procedure.

The World Bank project also led to the first operational agreement between BKV and MoB; the first version was signed in 1995. The agreement outlines route and schedule specifications for the network, performance indicators, remuneration of managers, and incentives based on output and service-quality indicators. Separately, BKV submits a business plan, including an operational budget and investment programme. The MoB's General Assembly approves the business plan and the amount of operational and capital grants to the company.

### Financial reform in the municipality of Budapest

Since the early 1990s, the Municipality of Budapest has realised exceptional growth of revenues from local taxes and from sales of properties and securities. The proportion of MoB's own revenues reached 48 percent in 2001 (MoB 2004b). Intergovernmental transfers include a share of personal tax, normative support, and earmarked funds. In 2000, total municipal expenditures were roughly HUF 260 billion (i.e. thousand million), of which HUF 138 billion were allocated for the operation of municipal institutions, and the remainder for development. MoB operation compensation to BKV (HUF 14.2 billion in 2000) represents roughly 10 percent of the municipal operating budget. In addition, MoB funds BKV with capital grants (HUF 5 billion in 2000).

MoB has also gained considerable borrowing experience. (First, access to domestic — then international — markets, and from money, to capital and bond markets were realised (Pallai, 2001). MoB maintains a favourable credit rating and a sophisticated loan portfolio.

There is an ongoing debate between MoB and the government regarding financing BKV's operations. The government maintains that MoB should use more of its reserves to fund public transport, while MoB asserts that the government should meet a greater share of compensation due to their refusal to raise tariffs according to MoB proposals.

## Public transport operations in Budapest

Budapest has nearly two million inhabitants, roughly 20 percent of the country's population, and extends over an area of 525 square kilometres. The history of the Budapest Transport Company dates back more than a century, and from 1996, the enterprise was operated as a joint stock company under 100-percent MoB ownership.

More than 200 lines operate on the roughly 1,130 km long public transport network. BKV served almost 1.5 billion passengers in 2000, and of these, roughly 40 percent travelled by bus, 26 percent by tram, 23 percent by underground railway (i.e. M1, M2 and M3), 6 percent by trolleybus, and 5 percent by suburban railway. Some further operational details are listed in Table 2.

**TABLE 1**

**Public transport ridership (in millions)**

| Year | 1990 | 1995 | 1998 | 2003 |
|---|---|---|---|---|
| **Total passengers** | 1,690 | 1,520 | 1,390 | 1,390 |

## Current sources of public transport financing

BKV has three main sources of operational revenue: fare receipts, MoB operational compensation, and government price compensation (for discounts allotted to students and pensioners). Cost recovery from BKV's own revenues has increased from 24 percent in 1989 to more than 50 percent in 2000, as seen in Figure 1.

However, the combined effects of fare revenue increases, cost reductions, and subsidies have not been sufficient for BKV to break even. The company has seen its liquidity suffer considerably in recent years due to reductions in compensation from the government and MoB that outpaced the increases in fare revenue it has taken in. Its net working capital at the end of 2000 was HUF 19.2 billion in the red. BKV has insufficient income to cover either necessary renewals or new acquisitions, and thus has a rapidly deteriorating fleet.

## Alternate financing sources, lessons learned

### Public-private partnership

BKV has taken modest strides with respect to encouraging private sector financing for the operation and development of urban transport. The first phase in increasing the role of the private sector was divestiture of non-core services and the creation of subsidiaries, which facilitated the possibilities for outsourcing. The second phase was a pilot programme, starting in 1997 and expanding in 2000, involving eight bus lines in southern Buda.

Financing preferences of MoB remain conservative, and both MoB and BKV officials continue to evaluate the benefits and timing of increased private sector involvement. Several municipal services were privatised in Budapest in the 1990s, including gas, water, and wastewater works. There was no pressure from private operators or international investors to enter

**TABLE 2**

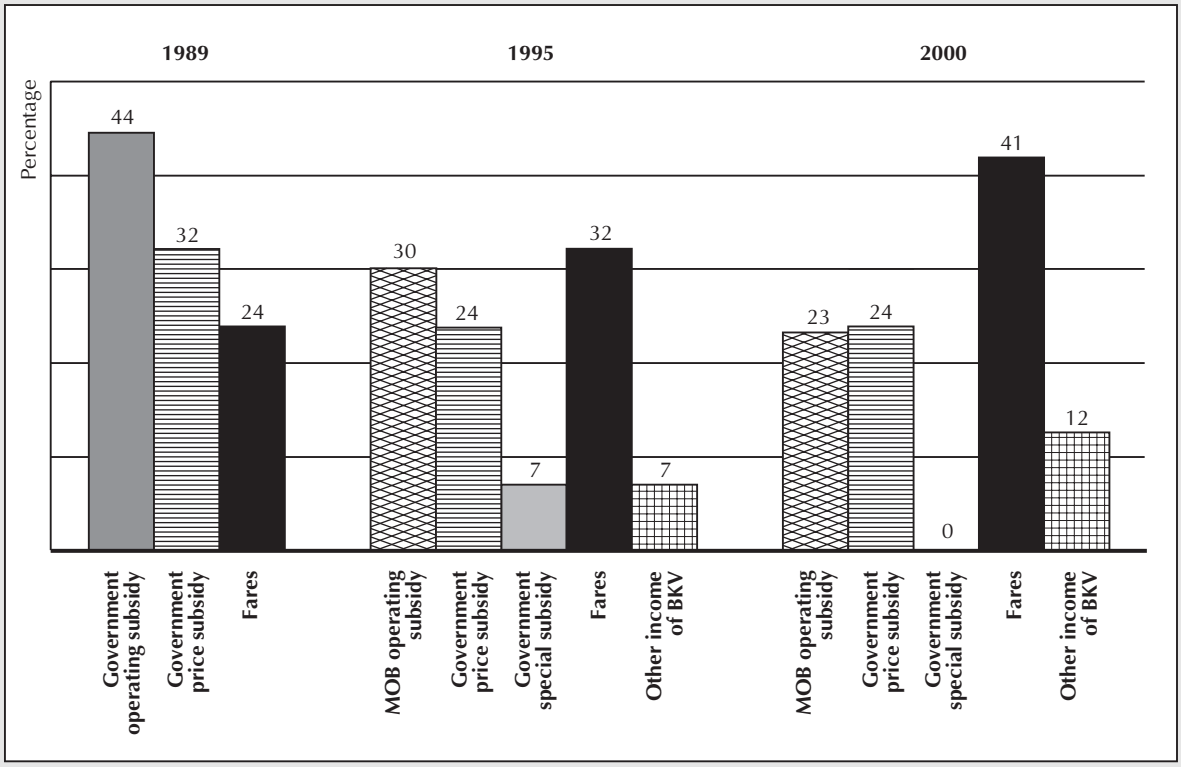
### BKV data for 1989, 1995 and 2003

| **Year** | **1989** | **1995** | **2003** |
|---|---|---|---|
| Total operational network (km) | 1133.7 | 1133.3 | 1133.2 |
| Total number of lines | 263 | 214 | 232 |
| **Average public transport speed** (minutes) | | | |
| Bus | 18.1 | 17.0 | 16.3 |
| Underground railway | 24.9 | 24.1 | 23.8 |
| Suburban railway (HEV) | 23.6 | 22.3 | 22.5 |
| Trolleybus | 13.2 | 13.0 | 11.6 |
| Tram | 15.7 | 13.7 | 13.3 |
| Boat | 5.2 | 5.6 | n/a |
| **Passengers transported** (thousands) | | | |
| Bus | 840,210 | 749,391 | 570,469 |
| Underground railway | 331,893 | 271,113 | 315,046 |
| Suburban railway | 95,675 | 66,952 | 63,494 |
| Trolleybus | 112,198 | 82,488 | 81,853 |
| Tram | 453,331 | 350,472 | 367,075 |
| Boat | 1,183 | 204 | 0 |
| **Total** | **1,834,490** | **1,520,620** | **1,397,937** |
| Total operational cost (HUF millions) | 14,908 | 33,751 | 84,141 |
| Revenue from Fare Receipts (HUF millions) | 3,099 | 10,098 | 30,850 |

Source of data: BKV 2004

FIGURE 1

**Breakdown of BKV revenue**




the public transport sector. BKV was progressing well in cost efficiency and level of service, but intergovernmental disputes resulted in uncertainty regarding external compensation.

### Polluter pays

Budapest has implemented a highly successful parking management programme, consisting of park-and-ride facilities, new parking garages, and the establishment of pedestrian-only zones. The parking scheme uses a pay-and-display technique, and is under private management. Parking fees are highest in the inner districts and diminish towards the fringes.

Starting in 2004, certain portions of parking receipts are earmarked for public transport financing (MoB 2004a).

Congestion pricing was a component of the Budapest Urban Transport Project (World Bank 2001), but was ruled out as "premature" just after the project was implemented. The introduction of parking fees was difficult enough to manage, and the project team decided that in order to consider road pricing as a viable option, all other restraint measures should already be in place. Proceeds from congestion pricing could be used to supplement public transport financing, but bank and company officials agreed that implementation of road pricing should focus on urban road infrastructure development, not public transport.

## Capacity strengthening

### Integration of public transport and land-use planning

For a number of years, integration of state-owned transport companies and BKV has been proposed for a number of reasons, including:

- improved creditworthiness (larger organisations);
- increased competitiveness (with the onslaught of motorisation), by offering more integrated transport solutions for customers commuting from the suburban areas into Budapest; and
- harmonised lines, junctions, timetables, etc.

There is general consensus regarding the desirability of the association, not only from the passengers' point of view, but also to reduce costs and increase patronage of the public transport system. However, there has been no agreement on compensating the three operators for predicated revenue losses.

### Service agreement between BKV and MoB

The service agreement between BKV and MoB should be further developed, particularly with regard to compensation covenants and longer-term planning. This will also require reconciliation of intergovernmental compensation transfers.

The bonus/penalty system could also be expanded to allow more incentives for cost efficiency of the company.

### Streamlining BKV operations

While public transport operators are pressured to maintain continuity, it is also important to adapt their systems in line with urban development and in accordance with externalities such as energy prices. The general trend of improving financial performance is to impose limits on the extent to which organisations can undertake unprofitable social services. For example, BKV should continue to evaluate the viability of the tramway system, a major money-losing operation for the company.

### Bias towards capital-intensive planning

City planners should further develop the integration of urban development objectives with improvements to the public transport system.

The decision to approve construction of the fourth underground railway line (M4) involved complex forecasting among municipal planners, government authorities, and international financial institutions. Reconciliation of the considerable debt burden to the central and municipal budgets was a major stumbling block, as well as possible restrictions on other public transport developments. Certain organisations, however, maintain that the funds to be spent on the M4 could have been better allocated in solving a wider scope of public transport development in Budapest, reaching a larger proportion of the passenger supply and having greater environmental and economic benefits (CEE Bankwatch Network, Clean Air Action Group 2002).

### Alternate sources of financing

MoB will start earmarking a proportion of parking receipts to supplement public transport financing. There are a number of other possible revenue streams to be considered. For example, in Paris, employers and retailers are obliged to pay a fee for increased access to labour and retail markets that public transport provides to them (UITP 2003). Earmarking portions of the central environmental fund, automobile registration fees, and other public revenue sources should be debated.

Engaging the private sector in the public transport sector will likely occur as risk conditions are gradually reduced and EU-conform regulations are in play. Ultimately, the municipality will need to justify whether outsourcing to private contractors will result in real gains in productivity or cost savings, as compared to financing public transport with its own reserves or borrowing capacity.

### Benchmarking practices

Benchmarking among the different transport modes offered by BKV and among comparable public transport providers throughout Europe would provide the company with a means to establish whether or not value for taxpayer money is being achieved.

### Customer service

Maintaining passenger supply is paramount to sustainable public transport development. Increasing fares, particularly at levels above inflation rates, must be accompanied with tangible improvements in quality. The public authorities ultimately have the responsibility to ensure that they have achieved best value for taxpayer money. It is essential that the public understands and supports measures taken to enhance public transport and curb traffic growth. Effective public communication is key to gaining this support.

## Barriers to financial reforms

The major factors affecting implementation of financial reforms in the public transport sector have been actions by the government with regard to local government finance, and the leverage it maintains on prices.

Decision-making power has been transferred from the central government to municipalities without the necessary control over sources of financing for these systems — notably the fiscal system.

## Sustainability, conclusions

The challenge facing Budapest (like many other urban metropolises) is how to achieve an acceptable balance between commercial concerns and social responsibilities of public transport, and, at the same time, remain competitive in the wake of rising automobile use. Investing scarce resources in a sector exhibiting a decline in demand is a difficult dilemma facing many governmental authorities. As documented by the International Union of Public Transport (UITP, 2003), the potential for public transport to contribute to mobility, to the functioning of urban economies, to the urban environment, and to combat social exclusion, should be recognised as the objectives of public transport. The fact that external funding is necessary for public transport providers should not lead one to the conclusion that

the companies are inefficient.

BKV is required to operate commercially and take the same legal form as any private enterprise, but the company operates under a sensitive socio-economic context. The company underwent substantial restructuring throughout the 1990s: it divested many of its non-core activities, created subsidies with an outlook towards possible outsourcing later, and made considerable improvements in productivity. Nearly 50 percent of BKV's operating revenue is now obtained from fare receipts and other own sources. However, decentralisation of fiscal management has been incomplete, and the government's concern about inflation and its desire to push public-sector companies towards greater cost efficiency, without balancing its interventions regarding fare increases and discounted travel with appropriate compensation, has had a negative impact on the company (World Bank 2001). With due respect, the government has had the delicate task of timing price liberalisation with wage movements and inflationary control.

Reconciliation of intergovernmental fiscal responsibilities needs to be achieved so that the financial viability of BKV's operations can be evaluated against long-term development strategies. With proper compensation covenants, creditworthiness will increase as external revenue streams are clearly definable and risk levels decrease (Cromwell and Bruggeman, 2004). This will foster greater interest from the private sector and financial institutions; hence, competition and levels of service will increase.

Public transport in Budapest has several positive aspects that could form the basis for long-term, sustainable urban transport development. Firstly, the network is well-developed, and there is a strong tradition of public transport use. Although public transport passenger trips decreased during the 1990s, they still represent more than 60 percent of the total passenger trips in the capital. Realisation of land-use and transport initiatives could be effective in reducing excessive suburbanisation and traffic congestion. This will depend partially on what MoB and the government will do to regulate the use of city streets by motor vehicles. MoB has made impressive progress using parking management as a means of restraint. Road pricing might be a more effective solution, but this will require considerably more foresight and coordination between urban road infrastructure and public transport planners. In the shorter term, the authorities are more in a position to realise that the associations between urban public transport (BKV), national railway operations (MAV), and the national bus service (Volan) request a crucial step in laying the foundation for a sustainable urban and interurban transport system in Budapest.

## References

BKV. 2004a. Personal communication. Budapest Transport Company. March 2004.

BKV. 2004b. Publicly available information: <www.bkv.hu>.

CEE Bankwatch Network. Clean Air Action Group. 2002. Press release dated July 4, 2002.

Cornwell, P. and G. Bruggeman. *Key Factors in Financing Urban Transport Modernisation: Some Lessons from Central Europe*. European Bank for Reconstruction and Development. London, 2004.

MoB. 2004a. Personal communication. Municipality of Budapest, Department of Public Transportion. March, 2004.

MoB. 2004b. Publicly available information: <www.budapest.hu>.

Pallai, K. *Financial Management Reform in the Municipality of Budapest*. World Bank Institute. Atlanta, 2001.

UITP. *The Financing of Public Transport Operations*. Position paper. International Association of Public Transport. Brussels, 2003.

World Bank. Budapest Urban Transport Project. World Bank. Washington D.C., 2001.

World Bank. 2001b. Cities on the Move. Conference Proceedings: World Bank Urban Transport Strategy Review. Regional Consultation Workshop. Budapest, February 28-March 01, 2001.

# Vilnius, Lithuania

## General data

On March 11, 1990 the Supreme Council of the Republic of Lithuania passed the Act for the Re-establishment of the State of Lithuania. Before that date and slightly after, all elements of the public transport sector were organised with a planned economy in mind. All subsidies for public transport during the Soviet period were provided by the ministries of communication and finance. Depots (for buses and trolleybuses) were obligated to prepare plans and forecasts for deferred income, runs and number of buses on routes for the next year. Ministries allocated subsidies for the following year according to these plans. Depots were able to cut down on the number of runs when facing insufficient subsidisation.

However, following the re-establishment of independence, the situation worsened. The lack of a clear legal basis for providing funding caused both Vilnius municipal bus companies to build up enormous debts. The main cause was the lack of reimbursements from the municipality for concessionary fares. Public transport in Vilnius suffered most from the economic declines of 1991-1994 and 1998-2000. The municipality provided compensation, but due to the economic situation and disputes with the government concerning the allocation of money for this activity, only a part of the calculated compensation has been given since 1994/95.

Private operators did not account for a large share of the public transport market in Vilnius in 1993-1995 and the provision of services was chaotic. The preconditions for operating a route were simple: a licence (purchase in tax inspection) was needed, along with coordination of the route with the transport group in the municipality, which was responsible for taxis and all other public transport operators. The department is very small, and employees are unable to control and coordinate such a large number of transport vehicles, which explains why the data on private operators is lacking.

Huge changes began with the establishment of Communication Services, a municipal enterprise that was founded (according to Resolution No. 230 of Vilnius City Council as of July 15, 1998) as part of the overall development of the public transport sector in Vilnius. Since the inception of Communication Services, the public transport system in Vilnius has undergone faster and more progressive changes. However, there are unsolved legal and organisational problems concerning the status of this enterprise.

### General information about Vilnius public transport

The average population density in the city of Vilnius was 13.8 inhabitants per hectare in 2003. The city has been expanding on the account of private constructions and adopted suburban areas. Usually the construction consists of semi-detached or detached private houses, which decreases population density. The construction of multi-apartment houses is still very slow, although its rate is the fastest in Lithuania.

Changes in the number of inhabitants in Vilnius during 1998-2003 are presented in Table 1.

All in all, it may be presumed that both residents and workplaces are going to be placed farther and farther from the city centre, resulting in urban sprawl. This trend can cause further problems for public transport because the net-

**TABLE 1**

**Number of Vilnius inhabitants: 1998-2003**

| 1998 | 1999 | 2000 | 2002 | 2003 |
|---|---|---|---|---|
| 578,400 | 578,300 | 578,000 | 553,400 | 553,200 |

work and social services would need to serve a greater area, as travel between residences and workplaces increased.

The last survey performed by Vilnius Municipality shows (see Figure 1) that the use of personal cars increased from 1998 to 2002. However, public transport still dominates city transport, providing 59 percent of the total transport needs (compared to 63 percent in 1998). The route network in Vilnius originally developed with trolleybuses primarily serving central areas, while buses operated on the outskirts and in suburbs. According to interviews, trolleybuses are most popular in the central part of the city (approximately one-third of Zirmunai, Karoliniskes and Zverynas inhabitants use trolleybuses), and buses are used more in the outskirt zones lacking trolleybus infrastructure (half of the respondents in Rasos, Naujoji Vilnia and Pilate). However, private cars are the most popular means of transport in peripheral zones with middle or upper-class inhabitants.

According to research into Vilnius public transport in 1998, passengers preferred trolleybuses (57.8 percent) and buses (39.3 percent) during peak hours. The share of private buses and minibuses was small (1.5 and 1.4 percent, respectively). The number of trips performed daily by one Vilnius inhabitant (only public transport) was 1.43 in 1998 (the number of Vilnius inhabitants is 578,400). However, no such survey was conducted during the 2002 research.

According to the 2002 research, trolleybuses transported 47.8 percent of all passengers, buses 41.5 percent and private operators 10.7 percent. The share of private operators increased, with private buses carrying 4.3 percent of all passengers, and private minibuses carrying 6.4 percent (see Table 2 for a breakdown of passenger ridership during peak traffic hours).

As mentioned previously, trolleybuses operate in the central part of the city, while buses provide transportation to the trolleybus network. The average trip lengths in 1998 and 2002 are as follows: trolleybuses 3.01 and 3.46 km; buses, 4.45 and 5.05; private buses, 8.89 and 7.8; and minibuses, 7.39 and 7.05.

During research in 1998 it became clear that only half of all private operators were working on the routes. It was duly stressed that control of this subsystem is not working properly, but to date there have been no changes. Official statistics provided by the municipality about private operators are unreliable. For example, information collected from private operators in 2001 differs considerably from information collected during public transport research in 2002 (official information from the municipality). Private operators proceed with impunity due to the lack of control and absence

**FIGURE 1**

**Modal spit (percentage): 1998-2002**

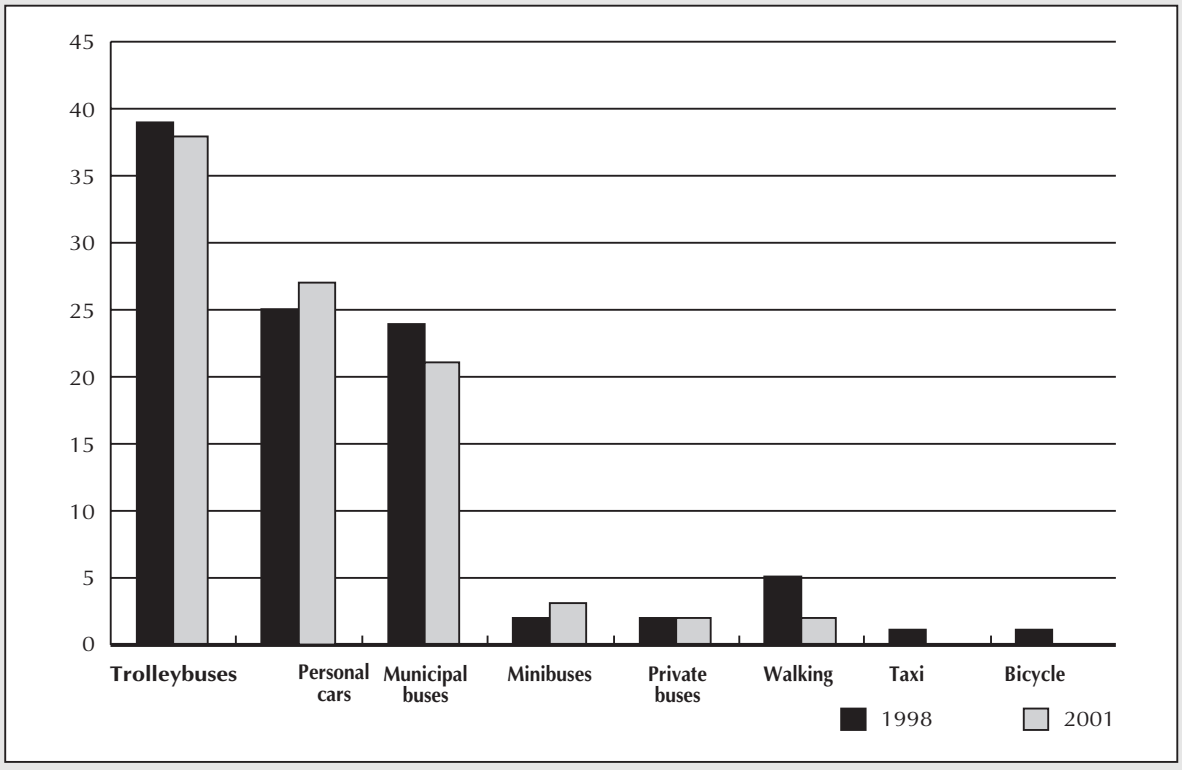


**TABLE 2**

**Public transport passengers in Vilnius in 1998 and 2002 (peak hours)**

| | Passengers transported | | |
|---|---|---|---|
| | **1998** | **2002** | **Change** |
| Trolleybuses | 74,371 – 50.5% | 54,437 – 47.8% | - 19,934 |
| Buses | 68,026 – 46.1% | 47,242 – 41.5% | - 20,784 |
| Private buses | 2,600 –1.8% | 4,912 – 4.3% | + 2,312 |
| Private minibuses | 2,400 – 1.6% | 7,239 – 6.4% | + 4,839 |
| **Total** | **147,397** | **113,830** | **- 33,567** |

of legal consequences, and are free to choose the best time to operate or close down a non-profitable route without any notification, which was pinpointed during all interviews with Communication Services. Meanwhile, municipal operators have to work according to contracts and schedules.

More detailed technical information about the performance of Vilnius public transport can be found in the appendix. The currency used in calculations is the Litas, which was officially introduced on July 25, 1993. From 1994 until February 2002, the Litas was linked to the US dollar, and the rate was fixed at USD 1 = LTL 4. From February 2, 2002, the Litas became fixed to the Euro at EUR 1 = LTL 3.4528.

### Related studies and perspectives

A considerable number of previous studies within the areas of public transport in Lithuania and the city of Vilnius have been carried out in the past. The implementation of various recommendations from these studies, however, has been rather limited. This study will take into consideration and build upon the research and recommendations from previous studies as listed in the references.

One of the most significant outcomes of these studies was the establishment of Communication Services in 1998. The necessity of one management company was emphasised in the Master Plan of Urban Transport for Vilnius City (1997). Other studies also recommended the strengthening of the public transport management body. However, because of legal and political problems, to date there is no clear division of functions between public transport actors in Vilnius.

There are studies related to the public transport sector that are financed/performed by foreign funds/specialists. Recent studies include one on the Vilnius public transport organisational structure (2001), a mobility and light tram feasibility study (2002), a project on route network planning (2002), and an ongoing new ticketing system project in Vilnius. Plans are to install new ticket machines (electronic cards) instead of punches, and to switch from one-time tickets to a time-based ticket system by 2006.

## Organisational development of public transport in Vilnius

### Main actors and roles

Pubic transport in Vilnius is undertaken by Vilnius Municipality. The bus and trolleybus companies are joint stock companies wholly owned by the municipality.

However, the bus and trolleybus depots were state-owned companies until 1992, and the bus company operated not only on urban, but also on interurban routes. The Lithuanian government decided to remise both depots to Vilnius Municipality in 1992. Later, in 1995, depots were re-registered as closely held joint stock ventures (CHJV) with special status. All shares of the companies belonged to Vilnius Municipality, and in 1996 the council decided to reorganise Vilnius Bus Depot, CHJV into two companies: Vilnius Bus Depot, CHJV with special status and Long Range Passenger Transportation Company, CHJV. After reorganisation, Vilnius Bus Depot assumed the role of urban/suburban operator. However, these were not the last changes of status for the municipal companies, and in the beginning of 2003, companies were registered as Vilnius Buses, CHJV (without special status) and Vilnius Trolleybuses, CHJV. Theoretically, this status allows the selling of shares to other parties but, for the time being, 100 percent of shares in municipal depots belongs to Vilnius Municipality.

There are a number of stakeholders acting within the Vilnius transport sector today. The major stakeholders are:

- Public Transport Group (in the City Economy Division, Energy and City Economy Department of Vilnius Municipality);
- Communication Services, municipal enterprise;
- Vilnius Buses, CHJV (or, Bus Company);
- Vilnius Trolleybuses, CHJV (or, Trolleybus Company);
- private operators with medium-sized buses; and
- private operators with small buses (minibuses).

There are neither city trains nor a light rail system. Vilnius train services play a role in regional traffic, but are a negligible part of urban transport. The current relationships between main actors in the organisation of public transport are shown in Figure 2.

Vilnius public transport is financed from municipal sources. The state covers part of the delegated duties (concessionary fares), but investments in municipal depots come exclusively from municipal financial sources. Almost all new vehicles purchased in recent years have been financed from the municipal budget (most recently from the municipal fund for environmental protection).

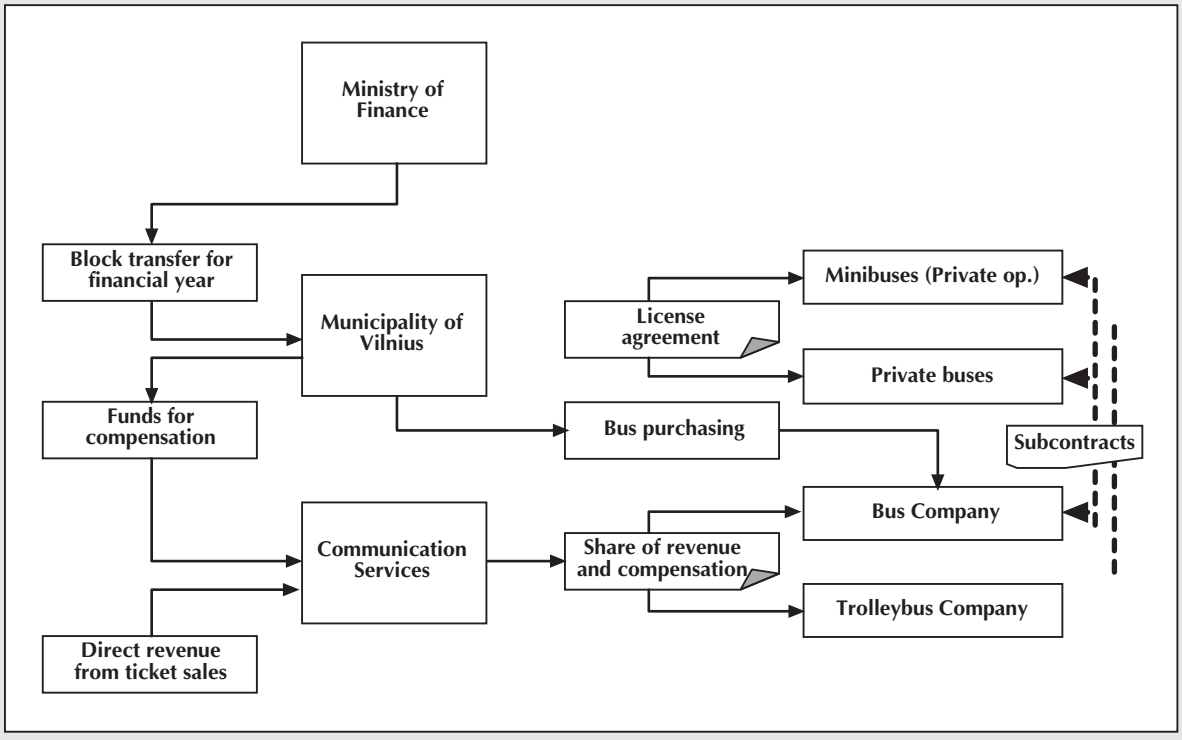
Delegated responsibilities are calculated during certain procedures. Communication Services prepares a forecast of needed compensation in the middle of the year, which it transmits to Vilnius Municipality. The municipality collects all information about needed compensation and submits information to the Ministry of Finance. The ministry then transfers the allocated sum for compensation (on the budget line for "transport and communications") to the municipality at the end of the year. There is no special line for public transport in this lump sum and, theoretically, all stated amounts should be covered. The municipality adds subsidies and then transfers these amounts to Communication Services. However, not all amounts have been covered through the years. Nowadays, the state is in debt to the municipality, and bus companies are in debt to the state (unredeemed taxes). Therefore, it is nearly impossible to distinguish state, municipal, and fare subsidies in these amounts.

Since the 1990s the municipality has been regularly negotiating this matter with the state administration, but nothing has been earmarked yet to transfer state funds to the municipality for public transportation. This situation makes it difficult to make more specific calculations and for the state and municipality to negotiate compensation.

Communication Services is the municipal enterprise that deals with public transport matters on behalf of the municipality. The group is a technical secretariat and the executor of the transport policy set by the municipality. As shown in Figure 2 and Table 3, the municipality and Communication Services have different roles in relation to the different operators. In reality this means that Communication Services today has no power to control or negotiate with private operators, since licenses and ticket prices are negotiated with the municipality in a separate department. However, the monitoring system is not working well under the Public Transport

**FIGURE 2**

**Main actors in Vilnius public transport and their basic relations**



Group. Communication Services fully controls municipal operators (performs ticket checks, prepares timetables, applies sanctions) and partly private operators (only ticket checks and preparing time tables). Table 3 contains a brief description of the roles allocated to the different institutions.

## Legal aspects and taxes

All bus carriers have paid VAT since May 1, 2000. Service suppliers and carriers should pay VAT according to the Value Added Tax Law (Article 3, chapters 12-13). The VAT Law was changed so that all public transport passengers should pay 5 percent VAT, which means that passengers pay 5 percent VAT to carriers, carriers pay 18 percent VAT to suppliers (for spare parts, tyres, etc.) and the difference should be reimbursed to carriers from the state budget.

The legal basis for the licensing system consists of parts of different laws:

- Civil Code;
- Law on the Principles of Transport Activities;
- ordinances from the Ministry of Transport and Communication;
- Road Transport Code;
- Law on Public Administration;
- various licensing rules;
- Law on Public Service;
- Law on Self-Government;
- Administration Offences Code; and
- Law on Passenger Transport.

There is no law concerning public purchase of the passenger carriage service. The new Law on Transport Privileges

**TABLE 3**

### Overview and brief description of institutional roles regarding public transportation

| State | Financial tasks | Planning responsibilities | Practical assignments |
|---|---|---|---|
| | National agreement on compensation scheme guidelines.<br>Allocation of overall compensation to municipality. | None | None |
| Municipality (Subdivision of city economy in the Department of Energy and Economy at Vilnius Municipality and Public Transport Group) | Transmits budget prognosis on compensation and negotiates final amount to be allocated to compensation scheme in municipal budget.<br>Determines fares/ticket prices for private operators (Council of Vilnius approves prices of municipal operators). | Agrees to/amends ticket prices.<br>Prepares and decides Vilnius Plan and Vilnius Vision 2020.<br>Decides the route network (daily) for private operators.<br>Introduces and terlminates routes.<br>Approves and coordinates timetables/route network for all operators | Licenses all operators and minibuses.<br>Signs contracts with all operators.<br>Purchases new buses.<br>Develops infrastructure.<br>Controls private operators (excluding passenger checks). |
| Communication Services | Distributes ticket revenue and compensation to operators.<br>Calculates compensation budgets/prognoses. | Decides route network (daily) for municipal buses<br>Develops and procures funds for new ticketing system.<br>Approves and coordinates timetables/route network for municipal operators.<br>Approves, adjusts and coordinates timetables for private operators. | Prepares/prints timetables for buses, trolleybuses and minibuses. Prints and distributes tickets.<br>Performs ticket inspection aboard municipal vehicles. |
| Activities not clearly allocated today | | | Control of private operators (buses and minibuses) |

came into force May 1, 2000. The law provides fewer privileges for passengers, and compensation for "privileged passengers" (see below) on local routes must be covered from the municipality budgets.

The law states that several socially disadvantaged groups are entitled to a discount of 50 or 80 percent on selected public transport fares. It should be noted that the discount is relative, which implies, for example, that the price for a disabled person to travel by bus in Vilnius might be different than in other Lithuanian cities.

Political factors are often a bigger influence on fare prices than economic ones. Recently, after an increase in fare prices in September 2000, the situation in Vilnius has improved, although complete operating costs are still not covered.

Private operators running medium-sized buses on a contractual basis with the municipality are obliged to carry privileged passengers at the reduced ticket price, but they do not receive any compensation for the "loss" of revenue related to lower ticket prices.

Communication Services would like to control transport operators. According to Lithuania's legal system, however, Communication Services can execute such functions only on an agreement basis. Nowadays Communication Services has contracts with municipal enterprises to perform such functions. Contracts with private operators have yet to be signed.

The Road Transport Code was changed in 2002. Changes to this act enable the municipality to transmit certain powers (control of operators) to a public agency. There will be no need to make agreements between the controlling institution and operators; this will be performed according to the Code of Administrative Offences and the Road Transport Code. The status of a "public agency" is suitable to perform these functions. A public agency is a non-profit organisation that also has the right to carry out economic-commercial activities in order to reach its goals. A political decision could transform Communication Services into an agency.

## Energy prices

Fuel prices in Lithuania more or less depend upon the situation on the world market and existing taxes set by Parliament. The excise tax has also been balanced and increased up to minimum requirements of the European Commission. However, European Union common policy has had limited influence on energy prices since a minimal level of excise tax was defined after negotiations with Lithuanian authorities. A decision has yet to be made whether the excise tax on fuel will be returned to operators of regular routes.

The new Law on Excise (currently being elaborated by the Ministry of Finance) stipulates that the excise tax on diesel fuel should grow from year 2002. As of April 4, 2004, the wholesale price of diesel fuel was LTL 2,451.79 per tonne, and A-95 petrol was LTL 3,015.41 per tonne.

The Law on Excise provides that the excise tax on diesel fuel will grow from LTL 560 per tonne to LTL 720 per tonne. It also proposes to increase the excise tax on liquid gas from LTL 170 per 1,000 litres to LTL 220 per 1,000 litres. In order to meet the minimum requirements of the EU, the excise on diesel should rise to LTL 1,200 per tonne. The excise tax on petrol is not likely to increase in the future, and should remain around LTL 1,250 per tonne. Besides the excise tax, the retail price of any fuel contains 18 percent VAT, as well as any profit for retail traders. However, this part of the price remains a trade secret and is negotiated with retail traders.

Another factor is import taxes on fuel. Starting from May 1, 2004 Lithuania introduced new taxes on imported fuel, according to EU requirements. The tax on imported fuel will fall from 15 percent to 4.7 percent. Experts predict that fuel prices will drop by LTL 5-7 cents.

Electricity prices have remained stable, but may rise in the near future because of the intended decommissioning of the first block of the Ignalina Nuclear Power Plant in 2005. Experts have forecasted price growth to be between 10-15 percent. However, the electricity market is already open (large consumers are able to buy electricity directly from the supplier), and the price depends on the ability to negotiate, which also creates the potential for discounts to the Trolleybus Company.

The expenditure structure of the Bus Company and the Trolleybus Company indicates that the costs for fuel/energy were 21.9 percent and 11.5 percent, respectively. From this perspective the Bus Company will be much more vulnerable to the expected rise in fuel prices than the Trolleybus Company will be to higher prices on electricity.

## Development of ticketing system

During 1991-1992, ticket prices were raised on six occasions because of hyperinflation (the price of a single ticket rose from 16 kopecks to 2 roubles). Later, with the introduction of a national currency, prices were raised several times, and in 1996 the price of single ticket became 60 cents. The ticket system was divided between municipal operators, who then became responsible for revenue collection.

All operators had separate tickets, and different departments were responsible for revenue collection until 1999. The ticket system was partly integrated in 1999 (see Figure 3). Ticket prices were approximately 33-40 percent in September 2000, and a common monthly ticket for both buses and trolleybuses was introduced at that time. Communication Services became responsible for revenue collection. However, the system covers only municipal operators and private operators are not included in this system. Tickets are valid for one trip only (there is no time-based system). Moreover, each separate private transport enterprise has its own accounting system (usually every private vehicle operating on route has a ticket dispenser on board), and it is extremely difficult to obtain data about revenue collection in this private sector.

In general, municipal public operators generate revenue from four types of tickets (with subcategories):

- single ticket for a bus or trolley bus (purchasable in vehicles for LTL 1.0 and at Kiosks for LTL 0.8; 50-percent or 80-percent discount for certain passengers, with the 80-percent discount tickets only available at kiosks);
- monthly ticket for bus or trolleybus (purchasable at kiosks at a price of LTL 35; 50-percent or 80-percent discount for certain groups; monthly card for workdays is LTL 28 with no discount available);
- monthly ticket for both bus and trolleybus (purchasable at kiosks at a price of LTL 50; 50-percent or 80-percent discount for certain groups; monthly card for workdays is LTL 40 with no discount available; introduced in September 2000 and has a rising market share); and
- one-, three- and 10-day tickets for both trolleybuses and buses (purchasable in two places for LTL 4, 10, and 20 with no discounts).

Ticket prices for private operators are LTL 0.7 for large buses, and often between LTL 1-2 for minibuses (max. LTL 2.5). There are no official figures (private operators provide data about carried passengers to the Department of Statistics, but this data is not separated from municipal operators in the official statistics) about the turnover of private operators, but a rough estimate is between LTL 5-6 million per year. (Some stakeholders think that medium-sized buses generate LTL 15-20 million).

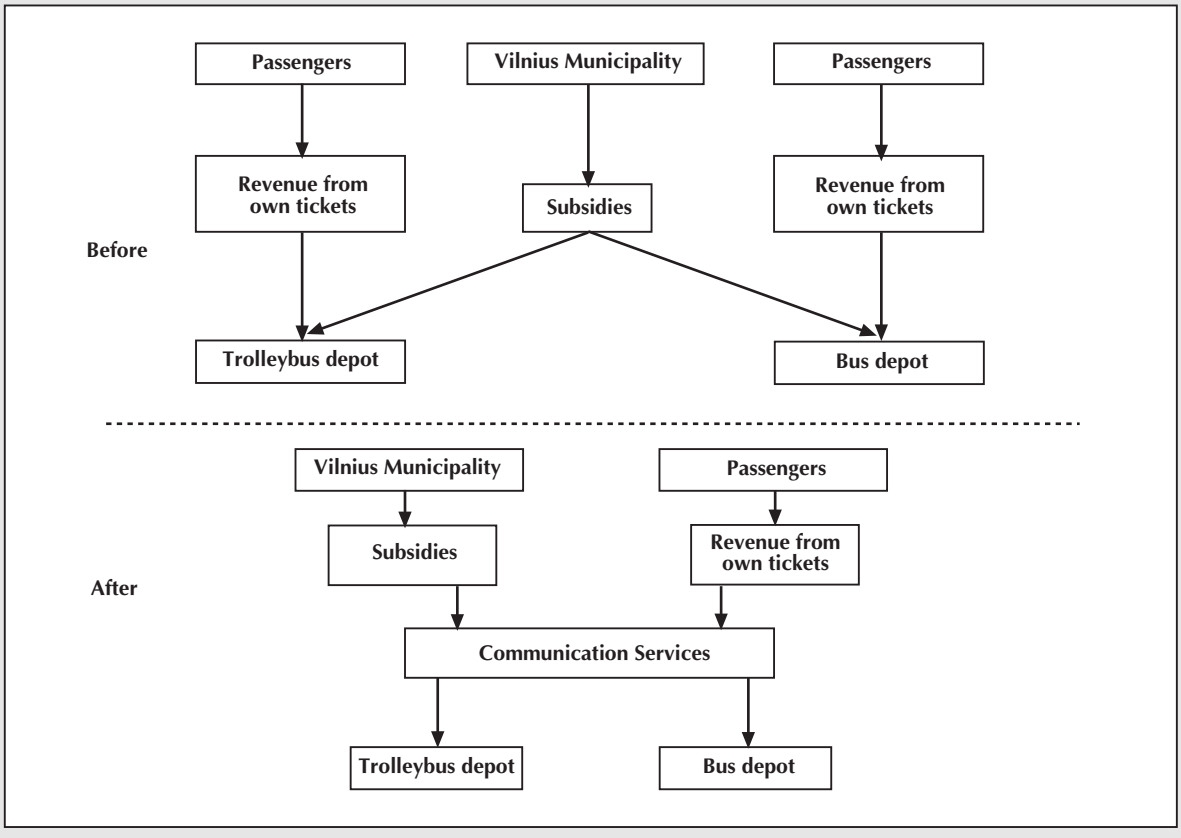
Finally, it should again be stressed that the sale of tickets and revenue to private operators on minibuses, medium buses and large buses is a closed and parallel system to the municipal system. Each operator who keeps the revenue also sells tickets separately. That is one of the main hindrances to obtaining data about the entire public transport system in Vilnius.

## Financial set-up

Communication Services gets a 4-percent share of the revenue of single tickets sold aboard vehicles, and a share of 15 percent of all other tickets sold (e.g. monthly tickets and single tickets sold in kiosks). Communication Services does not get a share of the compensation for concessionary fares.

**FIGURE 3**

**Distribution of revenue and compensations before and after 1999**



The enterprise received 66.6 percent of income from tickets in 2002 and 65.5 percent in 2003. Other revenues were generated from parking and other commercial activities.

After the share to Communication Services is deducted, revenue is split between the Bus Company and the Trolleybus Company according to the following methodology:

- Revenue from monthly tickets for buses is transferred to the Bus Company, and monthly tickets for trolleybuses is transferred to the Trolleybus Company.
- Revenue from single tickets (which can be used in buses or trolleybuses) sold at kiosks and the revenue from common monthly tickets are split proportionally to the company's share of total number of kilometres run by both the Bus Company and Trolleybus Company. For example, the bus company receives a share of the total common revenue according to the formula below:

$$\frac{85\% \times \text{total common revenue} \times \text{Bus km}}{(\text{bus km} + \text{trolleybus km})}$$

The factor of 85 percent is used because Communication Services receives 15 percent of this revenue. In Vilnius the basic financial set-up for the Bus Company and Trolleybus Company is as follows:

- Companies get a share of revenue from ticket sales. The actual share and calculation method is negotiated and agreed upon between the companies and Communication Services.
- Communication Services calculates the amount of privileged passengers and the matching economic compensation. The municipality provides the compensation, but due to economics and disputes with the government concerning the allocation of money for this activity, only a part of the calculated compensation has been given since 1994/95.
- The municipality owns and invests in the infrastructure and the rolling fleet.

Over the years, missing compensations (and, perhaps, politically imposed fare restrictions) have caused the actual income for the two companies to be less than operating costs, which has led to increased debt and insolvency (see Figure 4). In April 2001, total debts for both companies were LTL 61.5 million. LTL 57.8 million of this was income taxes from physical persons, together with fines on unpaid taxes. Annual turnover for both companies is LTL 79 million.

Due to the activity of Communication Services, LTL 2.1 million has already been saved by taking over the functions of fare selling and passenger control from the Bus Company and Trolleybus Company. The enterprise started to prepare timetables for the municipal operators in 1999, and for private operators in 2000. The coordination of bus and trolleybus work (route optimisation and reduction of idle runs) helped to economise further LTL 1.7 million.

As mentioned before, the municipality for some years has not paid the total calculated amount for compensation of concessionary fares to the bus companies, which is a main factor in the poor financial results. The municipality argues that reimbursement from the state is too low, and that in general there is not enough money for all the activities. Starting from July 1, 2000, Communication Services has presented invoices to the municipality concerning passenger carriage, according to the number of tickets sold, and from 2002 the municipality began to cover debts to the public transport sector (the municipality intends to cover debts through investments until 2006).

## Fleet renewal

Bad financing of the Vilnius public transport caused "perforce renewal" of the fleet in municipal enterprises. Purchases of second-hand buses and trolleybuses were financed mostly from independent budgets. Most of the new buses and trolleybuses were financed from the municipal budget (leasing, bank guarantees or the special municipal fund). To bring in new buses, the municipality has signed a triangular agreement with the bus/trolleybus companies and a leasing company.

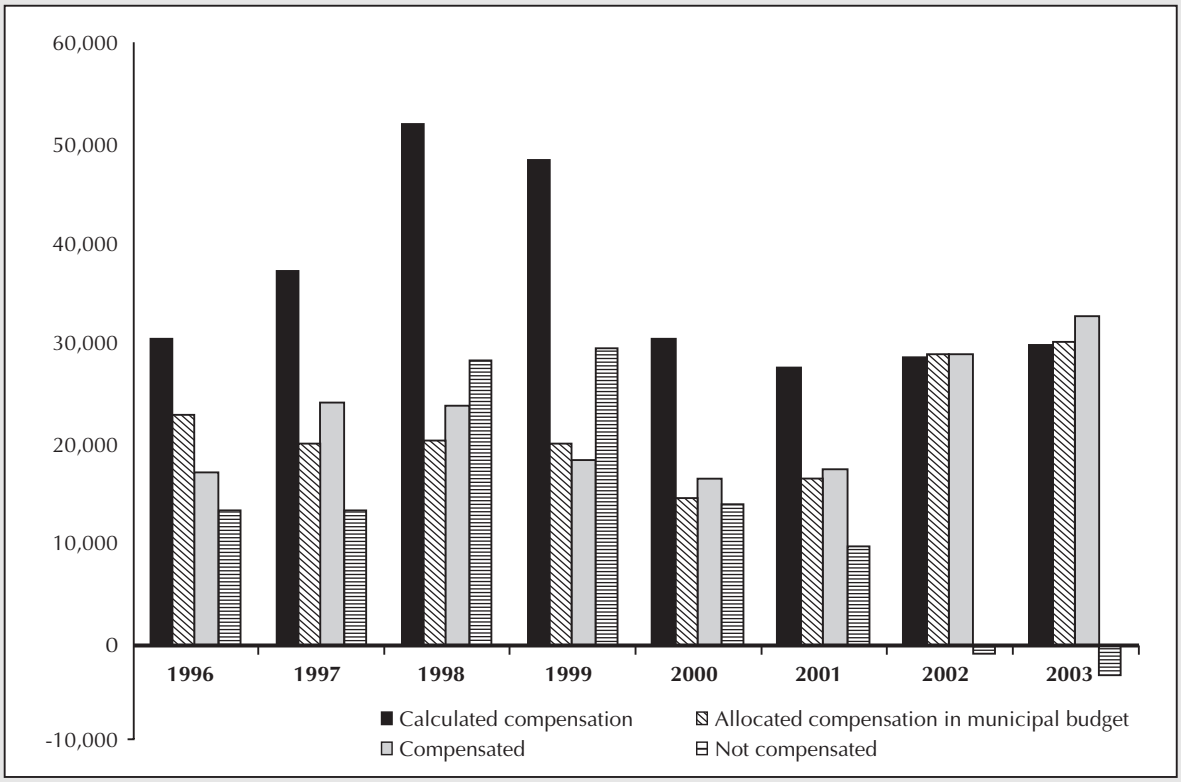
During its first years of operating independently, the bus depot received, gratis, 10 second-hand buses from Norwegian, German and Austrian municipalities. During 1993-1994, the municipality and Bus Company bought 16 second-hand buses from German municipalities. The Bus Company covered only 30 percent of the costs. Vilnius Bus Company bought new Karosa B-741 buses in 1994 for testing. After the tests, the municipality and the Ministry of Communications bought 11 such buses in 1995. Later the municipality financed the purchase of 36 buses (LTL 22,660,000) in 1996, 31 (LTL 19,340,000) in 1997, 10 (LTL 5,077,000) in 1998 and 28 (LTL 14,216,000) in 1999. The value of all these buses increased the authorised capital of Vilnius Bus Company. The company then sold old Russian buses and bought approximately 30 second-hand buses from Western Europe. Maintaining such a variety of brands has a negative influence on operational costs.

Vilnius Trolleybus Company purchased old vehicles from neighbouring countries and used these vehicles as spare parts to repair the old fleet – a main reason the old vehicles were kept on routes. However, the municipality also invested in the trolleybus fleet and bought new vehicles in 1990 (15 Skoda, 270,000 roubles), 1991 (8 Skoda, LTL 11,880,000), 1996 (30 Skoda, LTL 17,880,000), 1997 (30 Skoda, LTL 19,080,000), 1999 (15 Skoda, LTL 10,980,000) and 2000 (8 Skoda, LTL 5,856,000). The extension of trolleybus infrastructure (approximately two kilometres of cable network and substations) to the student district cost LTL 6,000,000 in 1998.

The number of vehicles owned by transport enterprises of Vilnius Municipality in 2001 can be seen in Figure 5. As of June 2001, the Vilnius Bus Company had 246 buses, of which 98 buses (40 percent) were up to 5 years old, 12 buses (5 percent) 5 to 10 years old, and 136 buses (55 percent) older than 10 years.

**FIGURE 4**

## Compensation to Vilnius municipal operators (LTL thousands)




The Trolleybus Company had an older vehicle fleet. Of a total of 303 trolleybuses, 77 (25 percent) were up to 5 years old, 7 (3 percent) were 5 to 10 years old and 219 (72 percent) were older than 10 years.

The municipality is planning to participate in the CIVITAS 2 programme and to receive funding for the fleet renewal. There were no attempts to finance public transport from foreign funds before this programme.

The municipality is neither participating in such projects nor searching for other funds because:

- There was huge competition during CIVITAS, and the procedure is time-consuming.
- Information about such environmental funds or international funding institutions is in short supply in Lithuania.
- The financial situation limits contact with foreign partners.

"Private and public partnership" is not defined in Lithuanian legalisation. Some municipal buses perform transport to the biggest mall centres on a public-private partnership basis, but it is a minor activity. Moreover, there were no private companies interested in public transport sector privatisation. There was some interest in privatising the Bus Company, but after an analysis of the current financial situation, the investors lost interest. The financial situation stabilised only a few years ago, and therefore the present situation is perhaps more favourable to initiatives.

Finally, the municipality bought 14 new Mercedes-Benz (4 CITO and 10 CITARO) buses for LTL 14 million in 2003. The buses were purchased from a special environmental fund (municipal allocations for environment protection). The municipality plans to renew the bus and trolleybus fleet during the next three years and to purchase 90 new buses and 45 trolleybuses. A three-year purchase programme shows that 30 new buses (20 medium size and 10 articulated) and 15 larger-sized trolleybuses will access Vilnius streets annually. The tenders have already been announced and the first contract could be signed in April 2004. Planned investments include LTL 70 million for buses and LTL 50 million for trolleybuses.

## Development of contracting system

Service levels and contracts are decided both by the Vilnius Public Transport Group and Communication Services. The division of responsibility between the two parties seems unclear and separated from the discussions of fare levels. The provision of an actual level of service in public transport also affects operating costs.

Theoretically, private operators can propose or close routes and departures on specific stretches if the municipality and Communication Services agree to it. Licensing and timetable- and route approval for private operators is performed by the municipal Public Transport Group (within the Department of Energy and City Economy), while municipal route planning goes to Communication Services and the Public Transport Group: thus, levels of service and financial matters are difficult to coordinate.

The current contracting process seems to be a mostly reactive process. The municipality receives initiatives for new routes (the municipal operator, Communication Services or municipality may start the procedure) and then analyses these with the assistance of Communication Services. Usually, the new route is initiated by agreement from all parties, so changes in the route system have been quite small throughout the five-year period. (Some routes were added mostly because of technical/political issues, rather than according to need.) Public services are needed in new, remote areas of the city, for example in the north and south of Vilnius (new single-house territories).

If an enterprise wants to operate on a route, it should have:

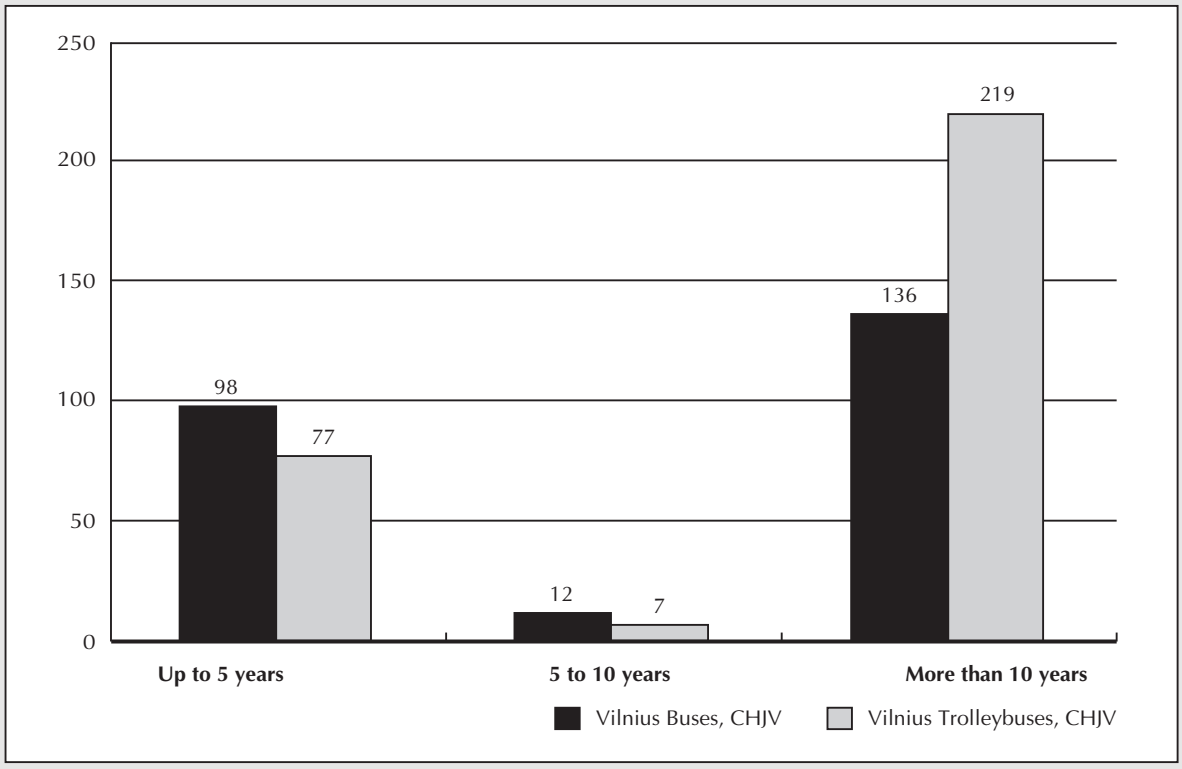
- a license for an enterprise (for public transportation activity);
- a license for a transport unit;
- a permit for a route; and
- an agreement with the municipality.

The municipal Bus Company has licenses, while the Trolleybus Company currently is not included in the licensing system (they have permission to operate without cards).

Communication Services has contracts with municipal operators concerning the provision of services and distribution of revenue. To ensure clear and fair competition among operators, Communication Services has a vision of becom-

**FIGURE 5**

**Age of buses and trolleybuses in 2001**



ing the sole contracting unit for the municipality. This includes establishing clear guidelines and unified procedures for the tendering out of routes. However, there have been no attempts to tender municipal operator routes.

The problem is that this system puts both the municipality – and especially Communication Services – in a more reactive than proactive role. They respond to outside initiatives instead of taking the lead in the planning route networks.

The contracting system itself seems to enhance this reactive role. As it is today, a license/contract with an operator (public or private) gives the operator the right to a renewal the contract if he or she has fulfilled the requirements. The municipality planning and reorganising the route network is thus restricted by existing contracts for a number of years.

Communication Services also clearly states that they themselves would prefer a management model, where they have a "service contract" with the municipality, with a stabile funding agreement and a clear and formalised set of goals to be achieved.

All in all, Communication Services has the ambition to become a full-scale management agency that has the competence to prepare and participate in planning, as well as policy making, while at the same time remaining a public enterprise. As described earlier, this is not possible within the existing legislation on public administration.

## Main challenges and recommended action plan

The main challenges are:

- distributing funds and revenues;
- improving the decision-making process when defining the service level;
- defining the future role of Communication Services; and
- assuring adequate data on passengers and traffic (especially for private operators).

For each challenge a number of concrete recommendations on necessary actions have been defined. The actions range from long-term changes of the legal framework, to changes of organisational and financial management of the sector in the short term.

### Distribution of funds and revenues

The lack of stability and coherence between service level requirements and the actual allocation of public funds has created a very serious financial threat to the publicly owned operators.

The budget procedures between state, municipality and Communication Services concerning the cost of the compensation scheme have resulted in underfunding, where the operating costs of the publicly owned operators are not even covered. At the same time, some of the private bus companies are facing demand to transport privileged passengers at reduced rates without receiving public compensation for tickets sold at those prices.

#### Recommendations for short-term action

A new financing model should be defined.

- This model should be based on gross contracts. In reality this implies subsidising non-profit routes, where actual revenue is lower than the operators' cost to deliver a politically mandated level of service. Operators receive a contractual fixed sum to cover operating costs. The costs are revealed in tendering procedures.
- Revenue from ticket sales should be collected through the municipal entity (future agency).
- A financing and practical model should be defined for a commercial super-system of minibuses (ensuring full control of private operators).

A new set of gross contracts between operators and the municipality should be defined and described.

- Contracts should ultimately be applied to all routes and the entire system (bus or trolleybus). In order to achieve this, the municipal entity should create a long-term plan for tendering the routes/system.
- As mentioned, there shall be a special contract/license system for minibus operators.
- Contracts should be for four or five years, with obligatory re-tendering after the end of the contract period.
- The criteria for awarding operator contracts (public or private) should be based on operating costs and the quality of service the operator will provide for the specific route.
- Potential routes should be contracted out logically in logistically coherent packages. When tendering one system, the contract should include all bus or trolleybus routes.

The data collection system should be redesigned so that it is in alignment with a new revenue distribution model.

- In order to support cost estimates and passenger forecasts, data collection should be improved and aligned with the strategy. This creates demand for new ticketing facilities.

#### Recommendations for medium/long-term action

Compensation funding coming from the government should be earmarked in the transfer of block subsidies to the municipality.

- The Ministry of Transport and Communication should negotiate on behalf of the municipalities with the Ministry of Finance on the required subsidises in order to maintain a high level of service for privileged passengers. The budget should be transferred directly from the Municipal Enti-

ty/Agency with a clear calculation of costs related to carrying privileged passengers at reduced ticket prices.

- Subsidies related to operating costs should be allocated on a separate budget line in the municipal budget.

The Agency should enter a service contract with the municipality securing a certain level of financing on the basis of a clearly defined set of responsibilities and tasks.

- The service agreement should be a two-year contract assuring financial stability for the agency. After two years, the contract should be revised and the agency should set new targets.

The cost of maintaining the infrastructure and rolling fleet should be transparent and part of the contract agreement.

- Detailed costs for such items as garages, offices, other buildings and the purchase of vehicles should be clearly stated. For trolleybuses there should also be some contribution to maintenance and renewal of the cable network.

## Improving the decision-making process for defining levels of service

There should be a clear connection between the organisational level that defines the required service level (number of routes, frequency, kind of vehicles, etc.) and the financing level. In order to establish this, it is necessary to have the possibility to calculate operating costs and possible revenue from a single route in order to establish the level of required subsidies.

Each decision concerning an expansion or reduction of the current service level should be accompanied by cost-, revenue- and subsidy anayses.

Recommendations for reaching this goal include:

- Service levels should be defined by one authority (municipal) only.
- Service levels should be based on consumer demand and budgetary constraints.
- A single unit should assume management of all contracts, ensuring transparency and equal terms.

## Defining the future role of Communication Services

In order to accomplish the strategy, a strong, professional and independent organisational body should be responsible for contracts and relations with operators, as well as the planning and management of transport services.

It must be emphasised that it is necessary to establish an organisation that has a clear definition of tasks and financial framework in order to maintain independence and professionalism.

### Recommendations for short-term action

- A clear separation of roles must be defined between the municipality and Communication Services.
- Future tender procedures should be planned (the municipality, with the assistance of Communication Services, should prepare a long-term plan for tendering of all routes).

### Recommendations for long-term action

- The implementation of tendering procedures for all routes should be completed within five years (if it is not tendering for the bus or trolleybus system as a whole).
- The role of a future agency should be defined during discussions between operators, the municipality and Communication Services.

## Adequate data on passengers and traffic

When the city of Vilnius invests in a new ticket system, it should also be used to facilitate and strengthen the collection of data concerning traffic.

Data on traffic is essential input for:

- planning and managing capacity of the network and routes (including supplementary vehicles during hours of operation — especially peak hours);
- optimising service operations (e.g. number of vehicles on the streets according to actual schedules for routes in the network);
- optimising the network according to passenger needs;
- dividing revenue (optimal splits for every bus departure in the normal system and for minibuses, which will undoubtedly involve great cost); and
- providing input during discussions and decisions (political and otherwise) concerning general service levels (e.g. the number of departures from specific locations at particular times of day).

New technology with on-board computers, automatic bus-positioning systems (often based on global positioning systems) and computerised ticket machines enable a great deal of automatically generated data about traffic, which (in theory) can be easily collected and processed by computer. Planned and used in the right way, these systems can deliver very useful management and planning information, but they also are expensive and costly to maintain.

It should also be noted that these systems cannot produce data concerning what passengers do before and after entering the public transport system, indicating that there is no precise information about passenger origins and destinations. This sort of supplementary data is needed when planning networks and route services.

## Conclusions

In general, the Lithuanian public transport sector lacks the financial resources or revenue from fares to finance the actual costs of operators. Additionally, the level of public subsidies is unstable – due not only to the budgetary relations between the state and municipalities but also internally in Vilnius Municipality.

In reality, Communication Services has insufficient influence on private operators. This clearly has a negative effect on the overall coordination and integration of the transport system as a whole. The future role of Communication Services is highly uncertain due to political and economic factors.

The actual tendering procedures and licensing carried out by the municipality (mini-buses) is characterised by a lack of transparency and has resulted in competition on the streets – and less competition in the tender procedures.

The system of licensing to different operators and the planning of routes and lines is not integrated. Similarly, the different ticketing systems are not adequately integrated.

However, the establishment of Communication Services has been a good initiative and an important first step in creating a competent organisation of the public transport sector in Vilnius.

Communication Services has, after a problematic start-up period and difficult situation in general, demonstrated good personal skills and relevant competence. Even though the financial situation has been and still is problematic, a successful investment plan has been implemented, which resulted in about one-third of all buses and trolleybuses being less than five years old in 2001. Moreover, due to the activity of Communication Services, LTL 2.1 million has been saved each year.

During recent years, passenger information has, to some extent, been improved in the form of updated maps, signs on buses, information at bus stops and information on the Internet.

The existence of new bus operators on the street has strengthened the passenger's ability to choose between alternatives, and has provided incentives for improved service from operators.

## References

*Evaluation of the Organisation of Public Transportation in Vilnius* (Lithuania-Denmark). VGTU and Ramboll sponsored by the Danish Transport Ministry. 2001.

COWIconsult, *Urban Public Transport in Lithuania: Strategy Study for the Commission of the European Communities Directorate General for Energy*. DG XVII, THERMIE. May 1994.

Atkins, W.S. *Master Plan of Vilnius Urban Transport*. TRANSURB CONSULT, FIDA. Phare, June 1996.

COWI, W.S. Atkins, FIDA, LITDANIA. *Master Plan of Urban Transport for Main Lithuanian Cities*. Commission of the European Communities. Phare-Programme, 96-0241.00-PHARE LI9404/0202. June 1997.

*Implementation of Urban Transportation Plans in Lithuania Phare Framework Contract within the Field of Transport*. FC 209. March 1999.

State Department of Statistics. www.std.lt

Communication Services. www.vilniustransport.lt

Research of Vilnius public transport system in 1998 and 2002 reports. Vilnius Gediminas Technical University, Department of Urban Engineering.

Conference Proceedings, of Urban Public Transport: Problems, Solutions, Perspectives. Vilnius. 2002.

ME Vilnius Plan, Special Plan of Vilnius Transportation Infrastructure Vilnius Gediminas Technical University.

SYSTRA. Tram feasibility study in Vilnius. 2002.

Technical and financial data collected during interviews with representative of Communication Services, Vilnius Municipality, CJSV Vilnius buses and CJSV Vilnius trolleybuses.

# Appendix

**TABLE 7**

## Vilnius public transport data summary: 1996-2003

| Year | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|
| **1. Operational network length (km)** | | | | | | | | |
| Municipal buses | | | 590 | 612 | 612 | 669 | 709 | 710 |
| Municipal trolleybuses | 376.9 | | 373.3 | | 429.7 | 429.7 | 418.7 | 423.3 |
| Private operators (buses) | | | 202 | | | | 261 | |
| Private operators (minibuses) | | | 649.3 | | | | 776 | |
| **2. Number of vehicles per mode (on routes)** | | | | | | | | |
| Municipal buses | | | 214 | 221 | 201 | 215 | 220 | 224 |
| Municipal trolleybuses | | | 242 | 249 | 245 | 250 | 252 | 258 |
| Private operators (buses) | | | 84 | | | 90 | 62 | |
| Private operators (minibuses) | | | 319 | | | 380 | 359 | |
| **3. Number of lines per mode** | | | | | | | | |
| Municipal buses | | | 57 | 56 | 57 | 60 | 63 | 62 |
| Municipal trolleybuses | | | 17 | 17 | 18 | 18 | 18 | 18 |
| Private operators (buses) | | | 17 | | | 19 | 19 | |
| Private operators (minibuses) | | | 74 | | | 51 | 62 | |
| **4. Number of trips (per Vilnius inhabitant)** | 1.43 | | | | | | | |
| Municipal buses | | | | | | | | |
| Municipal trolleybuses | | | | | | | | |
| Private operators (buses) | | | | | | | | |
| Private operators (minibuses) | | | | | | | | |
| **5. Average length of trip (km)** | | | | | | | | |
| Municipal buses | | 3.01 | | | | 3.46 | | |
| Municipal trolleybuses | | | 4.45 | | | | 5.05 | |
| Private operators (buses) | | | 8.89 | | | | 7.85 | |
| Private operators (minibuses) | | | 7.39 | | | | 7.05 | |
| **6. Average stop distance** (According to Lithuanian standards, the distance should be 500m.) | | | | | | | | |
| Municipal buses | | 636 | | | | 640 | | |
| Municipal trolleybuses | | | 548 | | | | 550 | |
| **7. Average public transport speed** | | | | | | | | |
| Municipal buses | | 18.75 | 19 | 21 | 22 | 23 | 23 | |
| Municipal trolleybuses | | | 17.00 | 17 | 17.8 | 17.8 | 17.8 | 18 |
| Private operators (buses) | | | 26.94 | | | | | |
| Private operators (minibuses) | | | 26.15 | | | | | |
| **8. Passengers transported per year** | | | | | | | | |
| Municipal buses | | | 107,500,000 | 98,109,050 | 93,872,697 | 107,378,979 | 116,750,084 | 126,274,912 |
| Municipal trolleybuses | | | 127,400,000 | 131,387,643 | 129,629,364 | 129,966,072 | 132,089,872 | 136,793,404 |
| Private operators (buses) | | | | | | | | |
| Private operators (minibuses) | | | | | | | | |

**TABLE 7** (CONTINUED)

## Vilnius public transport data summary: 1996-2003 (LTL figures given in thousands)

| Year | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|
| **9. Operational costs per year (LTL)** | | | | | | | | |
| Municipal buses | | | 44,558 | 41,983 | 38,094 | 42,143 | 45,372 | 47,736 |
| Municipal trolleybuses | | | 46,727 | 41,217 | 38,900 | 42,529 | 45,860 | 46,657 |
| Private operators (buses) | | | | | | | | |
| Private operators (minibuses) | | | | | | | | |
| **10. Municipal budget** (LTL) | 383,300 | 447,400 | 583,100 | 510,100 | 455,100 | 487,500 | 533,586 | 569,705 |
| **11. Investments** (LTL) | 40,540 | 38,420 | 11,077 | 25,196 | 5,856 | 0 | 0 | 0 |
| Municipal buses | 22,660 | 19,340 | 5,077 | 14,216 | 0 | 0 | 0 | 0 |
| Municipal trolleybuses | 17,880 | 19,080 | 6,000 | 10,980 | 5,856 | 0 | 0 | 0 |
| **12. Allocated sum to PT for compensation** (LTL) | 23,000 | 20,000 | 20,200 | 20,000 | 14,650 | 16,500 | 29,004 | 30,000 |
| **13. Current percentage of the municipal budget allocated to PT** (indicating the division between operating costs and investment) | | | | | | | | |
| Operation | 6.00% | 4.47% | 3.46% | 3.92% | 3.22% | 3.38% | 5.44% | 5.27% |
| Investment | 10.58% | 8.59% | 1.90% | 4.94% | 1.29% | 0.00% | 0.00% | 0.00% |
| **14. Ticket revenues** (only municipal operators, LTL) | 39,449 | 37,971 | 46,166 | 55,724 | 56,987 | 58,560 | | |
| **15. Revenue/cost ratio** | | | | | | | | |
| **16. Vehicle/km** (million km) | | | | | | | | |
| Municipal buses | | 14.41 | 14.14 | 13.52 | 14.90 | 15.73 | 16.29 | |
| Municipal trolleybuses | | 16.70 | 15.90 | 14.60 | 14.64 | 15.04 | 15.65 | |
| Private operators (buses) | | | | | | | 3.5 | 3.18 |
| Private operators (minibuses) | | | | | | | 33 | 26.88 |

# Annex 1
# Moving Public Transport along in Central and Eastern Europe

*This document contains conclusions from the meeting on Supporting Public Transport in CEE EU New-Member States and Candidate Countries held on December 16-17, 2003. Written by the participants themselves, the conclusions outline possible areas for work under a project supporting public transport in Bulgaria, Romania and the new member states of the European Union.*

Representatives from Sofia, Bulgaria; Prague, the Czech Republic; Tallinn, Estonia; Budapest, Hungary; Vilnius, Lithuania; Warsaw, Poland; Bucharest, Romania; and Bratislava, Slovakia (see list of participants) met in Szentendre, Hungary on December 16-17, 2003 to review the status of public transport in the CEE EU new-member states and candidate countries. The reviews were based on information collected by case studies and contributions of the participants.

By identifying and discussing current problems related to public transport, the participants engaged in dialogue on public transport reforms and developments at local, regional, national and pan-European levels. The exchange of experiences and practices was another important dimension of the meeting.

The ultimate goal of the project is to achieve a healthier urban environment through sustainable public transport.

The participants discussed the scope for possible future activities within the project. They may be summarised as follows:

- organisation of the public transport, including integration of networks, contractual issues and private-public partnerships; and
- exchange of experience and information regarding financial aspects of investments (long- and medium term), public transport operation and the EU public transport-related projects (including tendering, role of government and subsidies, additional financial sources, loan procedures and state guarantee issues, co-funding, fare setting, integrated ticketing, revenue collection, allocation schemes and charges).The exchange of experience and information will lead to capacity building in this field at local, regional and national levels.

- There will be an overview of the EU funding process, access to these funds and their programming – including identification of key decision makers in this field in each CEE EU new-member state and candidate country.
- There will also be an overview of the financial schemes to support public transport in each CEE EU new-member state and candidate country.

It was recommended to collect information, identify indicators, compare statuses, practices and performances of different countries, and to draw conclusions from them, based on study visits. Good examples from Budapest, Pecs (Hungary), Prague, Sofia and Warsaw were mentioned. The information and experience accumulated by, for example, UITP projects and other projects should be used to this end and to develop the following:

- parking policies and practices, including pricing policies and establishment of traffic restricted areas.

It was recommended to prepare case studies and in-depth analyses. It will be important to show both results and processes that lead to achieving these goals. Interesting case studies could be already found in ELTIS database. Other important tasks include the following:

- efficient provision of information on public transport, marketing and promotion of public transport, and traveller support via electronic tools; and
- awareness-raising of the public and decision makers on public transport as an asset contributing sustainable development.

The following issues were also emphasised during the discussions:

- Development and investment in the public transport sector (infrastructure and eco-fleet) should be undertaken with the goal of maintaining a relatively high (50-60 percent) public transport market share in CEE EU new-member states and candidate countries.
- The importance of state aid regulations of the EC and the efficient use by public transport stakeholders of the EU Cohesion and Structural Funds need to be addressed.
- The decentralisation of public transport responsibilities to the local level should be accompanied by adequate legal/regulatory means, capacity building and financial measures.
- Public transport planning and land-use planning must be integrated in order to gain efficient, sustainable, public transport.
- Use of available information technology tools for public transport reforms, improved decision-making, management and everyday operations were also highlighted. The use of such tools will also help to overcome the lack of sufficient and reliable data and information on public transport trends and challenges.
- Further work is needed to make public transport attractive, cleaner, safer, more reliable and accessible.

# Annex 2
# Supporting Public Transport in Central and Eastern Europe

*This document served as a basis for discussion during a meeting on public transport in the candidate countries and new member states of the European Union. It was written by Ausra Jurkeviciute and Grazyna Krzywkowska, project managers in the Environmental Policy Programme of the Regional Environmental Center for Central and Eastern Europe (REC). The meeting was held at the REC in Szentendre, Hungary on December 16-17, 2003. Conclusions of the meeting by its participants can be found in Annex 1.*

## Major trends and challenges based on case studies of Sofia, Tallinn and Warsaw

### Introduction

After the rapid loss of passengers in 1990-1995, varying between 15 and 25 percent in different countries, public transport in Central and Eastern Europe (CEE) entered a period of slower decline, with an average annual decrease in use of between 1-3 percent. According to the case-study authors, the reduction in public transport use amid the political and economic changes of the 1990s was caused by:

- a shift from public transport to passenger cars (due mainly to the opening of car markets, higher living standards, increased demand for public transport service quality and changing mobility needs);
- a the significant reduction of state subsidies to public transport;
- deteriorating public transport systems across the region; and
- a shift of urban transport responsibility from central governments to municipalities, which in most cases lacked the institutional capacity and financial resources to fulfil such obligations.

Currently, urban areas in CEE face growing traffic congestion, road safety issues, and rising air and noise pollution. Policy decisions and actions are needed to encourage a modal shift from road to rail, the design and construction of multi-modal transport corridors, changes in the present practice of priority highway investments, promotion of walking and cycling, and many other measures introducing and implementing sustainable transport concepts. The issues should be tackled comprehensively through a multi-dimensional approach.

Despite the financial constraints, CEE countries have made efforts to address public transport problems in recent years. Some big cities have developed and adopted sustainable urban transport policies; interaction and dialogue among competent authorities and public transport companies has started to improve; the first steps towards increasing the efficiency of public transport have been made; public transport fleets are being renewed; city road infrastructures have improved; ring roads have been built; and new metro-, tram- and trolley lines are being planned, extended or have started operating. However, in many other towns where the population still relies largely on public transport, many actions await final decisions. If the public transport sector is not improved immediately, urban environment and health will further deteriorate.

A long-term process has only just begun, but the present situation offers unique potential and opportunity for public transport in CEE. Active international support for ongoing efforts to improve efficiency, quality and reliability of the public transport service, combined with good existing practices, could lead to a stabilisation of public transport passenger volumes and positive short- and mid-term development. The project to promote public transport in the CEE region made a number of findings that are now on the table for review and comment. By introducing this set of problems, the REC aims to establish communication between various interest groups and policy makers at local, national and pan-European levels, to find solutions and offer support to those seeking a healthier environment though improvements to the public transport sector.

The following major trends and challenges in public transport have been identified though the studies conducted in Sofia, Tallinn and Warsaw by public transport experts preparing case studies.

### Mobility

- The number of trips has declined significantly for all means of public transport – in some countries by as much as 70 percent.
- Private car ownership has increased: hence the number of car trips has increased (nearly three-fold in Tallinn).
- The current public transport system does not offer attractive alternatives for the numerous new car owners.
- Time delays and street congestion are increasing for both private cars and public transport, affecting both passengers and operational costs.
- Traffic -related accidents, noise, air pollution end energy consumption levels are all increasing.
- Car parking needs, road/street blocking and, hence, traffic obstruction are also on the rise.
- New residential areas often lag behind old urban areas in establishing public transport services: private car ownership is promoted as a result.

### Public transport management

- There is a lack of inter-modality, connections and links with other exiting public transport modes.
- Public transport systems have not developed fast enough to compete with private cars.
- With few financial resources, attempts at fleet renewal, infrastructure repair, modernisation and system development are reduced to bare minimums.
- The market share of public transport in relation to other means of transport has decreased – in some cases as low as 31 percent (Tallinn, for example).
- The average age of buses and trolleys in some countries is 20 years, and more then 26 years for trams.
- The basic structure of public transport systems has remained almost unchanged for the last 10 decade.
- Overcrowding and ageing fleets cause low service levels.
- There are no significant modal policies or traffic-management measures favouring public transport.
- The average speed of buses has slowed to 17.8 kilometres per hour in Warsaw – trams to 15 kilometres per hour.
- Suburban railway services have deteriorated.
- Municipalities have retained regulatory functions for public transport (service patterns, schedules, fares), which are often carried out by a specialised transport authority, leaving operations to company management. Relations between operators and municipalities are regulated by service agreements (contracts).

### Public transport financing

- Expenses for public transport have increased since the beginning of the transition period, and most state governments in the region have stopped financing public transport (with the exception of the underground railway). States do not subsidise public transport operations – or provide very low amounts.
- Responsibility for public transport has been shifted to municipalities, but, as a rule, the state collects tax revenues.
- The lack of sufficient investment in public transport has resulted in an outdated rolling stock fleet and under-investment in public transport infrastructure.
- Fares are not adjusted on a regular basis, and no long-term fare policies are in place.
- Public transport companies do not receive full compensation for discounted fares and free rides given by the state (e.g. in Warsaw).
- State policies make it practically impossible or very difficult for municipalities to use funds from international financial institutions at their disposal, and state-loan guarantees remain an issue, as is the case in Warsaw.
- The fact that municipalities operate according to annual budgets makes long-term investment into public transport virtually impossible.

## Conclusions and recommendations

- Cities in the region have developed good policies and plans on how to manage or move towards sustainable development in the public transport sector, but they must now be put into practice.
- Without a significant and visible change in current policies, the negative trend in public transport system development will continue – marginalising public transport as a means for low income groups only.
- Surveys reveal a public preference for buses and trams, even among private car owners. There is a notable passenger preference for trams over buses. This option can be exploited further.
- Tram systems need to be rehabilitated and modernised.
- Advanced systems of public transport management and traffic control should be introduced, with priority given to public transport.

- Revision of fare policy (and integrated ticketing and control), refinancing of discount fares, an introduction of charges for roads and city parking use, with direct allocation of a part of the revenues to public transport should be planned.
- The absence of any state interest in public transport management issues is abnormal and has brought the public transport situation to its current status of degradation.
- Adequate financing for public service obligations and redistribution of taxes (including fuel excise tax) and revenues need to be assured.
- Financing for suburban railway services needs to be assured.
- Cooperation between local governments in the metropolitan areas needs to be strengthened.

## Urgent needs in the surveyed cities

The following public transport needs regarding management, infrastructure and financing call for urgent attention:

- renewal of tram and bus fleets (public tenders, eco-fleet);
- upgrade of selected tram lines serving main corridors crossing city centres;
- introduction of short sections of tram line in peripheral zones;
- introducing tram and bus priority traffic control at intersections;
- extension of bus lanes;
- introduction of integrated management and control of public transport and car traffic (and control system) system; and
- improvement of the quality and service level, including an increase of operations (vehicle/kilometre), to decrease vehicle impact.

Urgent issues related to mobility management include:

- discouraging private vehicles from entering the city, introducing paid parking (zoning), building more parking lots, adjusting parking fees, development of a park-and-ride system, and employers/schools mobility plans or car-pooling; and
- public transport promotion as environment friendly, quick, comfortable, reliable, accessible and safe.

# Annex 3
# Proposed Priority Areas of Work on Promotion of Sustainable Transport in CEE

## Introduction

### Environmental impact of urban transport and European Union policy response

With two-thirds of the EU's population now living in cities, measures need to be taken to reverse the ever-growing motorisation, congestion, air, noise and soil pollution caused by transport. Such measures are taken by the EC bearing also in mind growing transport needs, growing transport energy needs, oil dependency of 98 percent and transport's contribution to global warming, deterioration of public health and quality of life. Dealing with these problems in urban areas is imperative because estimates suggest that passenger cars cause 40 percent of the transport sector's $CO_2$ emissions. A thorough integration of environmental concerns into transport policy requires that the environmental impacts of a transport policy are taken into account alongside economic and social concerns when the policy is designed.

The EC has implemented Article 6 of the EC Treaty[1] on sectoral integration through the Cardiff process since 1998. Integration involves agriculture, transport, energy, industry, internal market, economic and financial affairs, and fisheries. Additionally, the EC 6th Environmental Action Programme (EAP) "Environment 2010: Our Future, Our Choice"[2] provides for the development of thematic strategies by 2005. The strategies directly related to the integration of transport and environment concerns are: the Strategy on Environment and Health[3]; the Strategy on Urban Environment[4]; and the Strategy on Air Quality.

The 6th EAP calls for extensive sectoral integration, which means monitoring progress with indicators and benchmarking, stimulating it though integrated land-use and transport planning, or "greening" the EC funding. The EAP declares the public transport of new member states and candidate countries an asset that needs to be protected. Moreover, the alternatives to road transport need to be supported to reduce air and noise pollution and to address environmental health problems caused by increasing motorised transport. For example, car ownership has risen by 65 percent in these countries in the past 10 years (compared to 20 percent in the EU 15).

The need to reduce energy consumption and increase the use of renewable energy sources is recognised by the EC Green Paper, "Towards a European Strategy for the Security of Energy Supply" of 2000.[5] The EC Sustainable Development Strategy, adopted by the Gothenburg European Council in 2001[6] recognises congestion and global warming among the main threats to sustainable development. It calls for an increase of inter-modality in transport and the development of public transport and/or railway infrastructure. This goes hand in hand with EC transport policy guidelines until 2010.

The 2001 EC White Paper, "European Transport Policy for 2010: Time to Decide"[7] (hereinafter White Paper) seeks greater transport inter-modality, the elimination of bottlenecks and the consideration of transport users' rights in efforts to combat congestion and air and noise pollution. The White Paper proposes over 60 measures that could assist in building sustainable transport in, ideally, 30 years. The measures would gradually decouple economic growth and transport growth. At the same time, it warns that sustainable transport must be achieved without compromising the economy, well-being and mobility demands of all European citizens.

Sustainable transport is transport that meets the mobility needs of society without endangering public health or ecosystems. Creating such transport can be done by developing public transport, promoting non-motorised means of transport (such as railways, waterways, cycling and walking), discouraging car usage in urban areas and by supporting cleaner technologies for motorised transport. Sustainable transport measures currently in use in the EU include: promoting cleaner vehicles; promoting public transport and non-motorised transport; promoting integrated land and urban planning with transport planning; making public transport fully accessible and attractive; improving city logistics for freight transport; introducing transport management schemes through parking policies and access restrictions; and introducing information technology systems for traffic management. The EC has supported sustainable transport policy making and implementation through projects such as the

CIVITAS Initiative, Clean Urban Transport for Europe (CUTE) and the Voyager initiative.

### New member states and candidate countries

#### Challenges of EU policy

Many institutions in the new member states and candidate countries are new or newly reformed. They currently implement EU policy guidelines, legislation and standards. To this end, they need access to appropriate financing sources. These institutions are also often weak and inexperienced and still lack the capacity to implement innovative measures. There are frequent lapses in the implementation of new laws and policies in the new member states, often due to a lack of experience or the need for training and awareness building. These and many other developmental pre-conditions in the new member states and candidate countries have significantly added to the challenge at the European level to meet the goals of the White Paper and to work towards a sustainable transport system. Moreover, the status of transport infrastructure within these countries lags considerably behind that of the EU 15, such that considerable planning and investment is still needed to fully modernise infrastructure, as well as to meet economic demands.

#### Implementing EU policy

New member states and candidate countries have a good modal split between passenger car use and public transport use, or among road, railways and air transport. They also have lower transport energy consumption and emissions than the EU 15. The summary of the case studies included in this publication outlines local actions undertaken to improve public transport and promote it. These include fleet renewal, traffic management information technology (IT) tools, giving priority to public transport, and limiting car usage in the surveyed cities. These measures require significant resources and therefore advance slowly. Despite financial problems, municipalities have started introducing traffic management systems promoting public transport, for example, and discouraging the use of private cars. This should not be reversed and the promotion of good practices in urban transport in building sustainable transport systems should continue.

National policies in the new member states and candidate countries tend to be ambitious and wide-ranging, with a stated focus on sustainable development, including a modal shift away from car use in cities. At the same time, national action programmes, including development programmes and investment plans, tend to focus on infrastructure development and improvements. To achieve the shift from the stated focus on sustainability to actions, the continuous capacity building of policy makers and implementing bodies of the new member states and candidate countries is needed.

## Priority areas

The project on Promotion of Public Transport in CEE implemented by the REC until September 2004 (the activities of which are described in the executive summary of this publication) focused on building the capacity of the local public transport operators and transport or environment authorities in sectoral integration. More than 120 practitioners participated in the meetings, workshops and site visits, and their ' network has been created and maintained during the project's implementation. They formulated the areas of future work summarised below. These priorities go beyond public transport and deal with sustainable transport development to reflect the importance of providing society a full range of transport options, such as attractive, accessible and efficient public transport, safe cycling and walking, as well as their integration.

The REC's in-house expertise and activities will continue to address the complex needs of sustainable transport – public transport in particular – in CEE. One example is the integration of the REC's work under the Partnership for Clean Fuels and Vehicles. In its future work the REC will continue to take into account and build upon the new developments in the EU, as well as the work of the Health and Environment Pan-European Programme (THE PEP) of UNECE/WHO, the European Committee of the Ministries of Transport (ECMT), OECD, UITP and other organisations active in the field of sustainable transport.

The following priority areas of work on sustainable transport promotion in CEE are proposed:

- Integrated urban planning to reduce the number of car trips in favour of use of public transport, railways, cycling and walking – promotion of best practices in integration of environment concerns into transport policy making and implementation in order to reduce transport emissions, congestion, urban sprawl and increasing energy use. This includes the use of strategic environmental assessment (SEA) as such a tool at all levels of policy making, having in mind the requirements of the EC Directive on SEA, adopted in 2004.
- Use of available information technology tools for efficient urban transport planning and management – promotion of best practices in, for example, public transport prioritisation via traffic management systems, making inter-sections safer for cyclists or electronic ticketing.
- Capacity building in the use of economic tools, fiscal measures, and other financial and legal measures to finance sustainable transport. These include: subsidies, environmental funds, international financial institutions, private sources and private-public partnerships. The use of the Structural Funds and the Cohesion Fund provided for regional development under EU cohesion policy will be explored here in particular. The two funding instruments currently cover investments in such sustainable modes of transport as modernisation and develop-

ment of railways and urban public transport. Beneficiaries of the planned project can be given training on the specifics of the planning and programming processes, as well as general requirements for the preparation of applications for EC funding. Beneficiaries of this project will also be able to engage in dialogue with authorities dealing with fund programming.

Work in these three fields will be done on the local level through exchanges and the preparation and dissemination of best practices. It will be possible thanks to the creation and support of an interdisciplinary network of CEE stakeholders dealing with sustainable transport, built upon an informal network of public transport practitioners created under the project on Promotion of Public Transport in CEE.

The interdisciplinary network of stakeholders will facilitate:

- the exchange of knowledge on sustainable transport policy making trends;
- the exchange of experience on financial aspects of public transport investments and operations; and
- the exchange of experience related to integration of transport, land and urban planning and the integration of different environmentally friendly transport modes.

The network will assist the coordination of work and understanding between municipalities, public transport operators and NGOs, and in the promotion of non-motorised modes of transport. It will also assist in informing local decision makers on the impacts of transport on the urban environment and the urgency of environmental problems caused by transport. The network's work will communicate sectoral integration needs and principles to decision makers on the local level. The network will enable project beneficiaries to be continuously updated on EC-level policy making in transport and environment, as well as with their sectoral integration. Additionally, beneficiaries will get to know each other's national priorities and trends in policy making in these sectors and their integration, and they will explore solutions for common problems.

## Endnotes

**1** Consolidated text of the Treaty Establishing the European Community, OJ C 325, December 24, 2002. Decision No. 1600/2002/EC of the European Parliament and the Council of July 22, 2002 laying down the Sixth

**3** Community Environmental Action Programme, OJ, L 242 September 10, 2002.

**3** Communication from the Commission to the Council, the European Parliament, and the European Economic and Social Committee. A European Environment and Health Strategy, COM(2003) 338 final, June 11, 2003.

**4** Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of Regions. Towards a Thematic Strategy in the Urban Environment. COM(2004) 60 final, February 11, 2004.

**5** COM (2000) 769, November 29, 2000.

**6** Communication from the Commission. A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development, COM (2001) 2 64 final, May 15, 2001.

**7** COM (2001) 370 September 12, 2001.

**THE REGIONAL ENVIRONMENTAL CENTER FOR CENTRAL AND EASTERN EUROPE** (REC) is a non-partisan, non-advocacy, not-for-profit international organisation with a mission to assist in solving environmental problems in Central and Eastern Europe (CEE). The REC fulfils this mission by promoting cooperation among non-governmental organisations, governments, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision making.

The REC was established in 1990 by the United States, the European Commission and Hungary. Today, the REC is legally based on a charter signed by the governments of 28 countries and the European Commission, and on an international agreement with the government of Hungary. The REC has its head office in Szentendre, Hungary, and country offices and field offices in 16 beneficiary countries which are: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYR Macedonia, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia and Turkey.

Recent donors are the European Commission and the governments of Austria, Belgium, Bosnia and Herzegovina, Canada, the Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Japan, Latvia, the Netherlands, Norway, Poland, Serbia and Montenegro, Slovenia, Sweden, Switzerland, the United Kingdom and the United States, as well as other inter-governmental and private institutions.

# Next Stop: Sustainable Transport

A Survey of Public Transport in Six Cities of Central and Eastern Europe